

Message

From: Jeffrey H Birk [jeffrey.birk@basf.com]
Sent: 4/25/2017 6:49:52 PM
To: Montague, Kathryn V. [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c50d485150734f6e85059d64dd80a353-Kathryn V. Montague]
Subject: RE: Engenia premix with pyroxasulfone herbicide?

Thanks Kay,

Jeff

From: Montague, Kathryn V. [mailto:Montague.Kathryn@epa.gov]
Sent: Tuesday, April 25, 2017 2:48 PM
To: Jeffrey H Birk <jeffrey.birk@basf.com>
Cc: Rowland, Grant <Rowland.Grant@epa.gov>
Subject: RE: Engenia premix with pyroxasulfone herbicide?

Hi, Jeff,

I'll need to run this by EFED. They pretty much require a standard set of data for everything with these uses/products, so I'm not sure you'll be able to not do the field flux testing, but I will let you know what they say.

Best Regards,
Kay

From: Jeffrey H Birk [mailto:jeffrey.birk@basf.com]
Sent: Tuesday, April 25, 2017 9:35 AM
To: Montague, Kathryn V. <Montague.Kathryn@epa.gov>
Cc: Rowland, Grant <Rowland.Grant@epa.gov>
Subject: Engenia premix with pyroxasulfone herbicide?

Hello Kay,

BASF is in the process of developing a new end-use-product containing the BAPMA salt of dicamba and pyroxasulfone herbicide for use in DT cotton and soybeans. BASF expects to be able to submit this new dicamba premix for registration in 1Q18. In putting the development program together, the question about the need for field flux testing came up. After discussing internally and considering any impact that this premix may have on the overall volatility characteristics of the BAPMA salt of dicamba, BASF has concluded that the volatility concern for this proposed premix would be no different than that for Engenia herbicide, and therefore, no additional field flux data should be required. The reasoning for this decision is as follows:

- The new product contains the BAPMA salt of dicamba, which has already been evaluated for field flux, as Engenia herbicide.
- Pyroxasulfone herbicide is not volatile.
- Pyroxasulfone is non-ionic and is not formulated as a salt
- There are no other salt forming components in the product formulation that can degrade the low volatility nature of the dicamba/BAPMA salt.
- There is no expectation that the volatility potential of this BAPMA salt of dicamba and pyroxasulfone herbicide premix will be different than Engenia.

Please let me know as soon as possible if EFED should disagree with this conclusion. Any required field flux studies will need to be conducted in 2017 to meet our 1Q18 submission target.

Thanks,

Jeff

Message

From: BHAKTA, TINA [AG/1000] [tina.bhakta@monsanto.com]
Sent: 4/6/2017 2:43:24 PM
To: Montague, Kathryn V. [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c50d485150734f6e85059d64dd80a353-Kathryn V. Montague]; Rowland, Grant [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=5b004bc79f1f40b0a181a584a8c64495-Rowland, Grant]
CC: MARVIN, THOMAS [AG/1920] [thomas.marvin@monsanto.com]
Subject: RE: patent search

Re-sending as got a bounce back from Grant.

Tina Bhakta Ph.D.
Global Chemistry Expansion Lead, Regulatory

From: BHAKTA, TINA [AG/1000]
Sent: Thursday, April 06, 2017 9:41 AM
To: 'Montague, Kathryn V.' <Montague.Kathryn@epa.gov>; Grant.rowland@Epa.gov
Cc: MARVIN, THOMAS [AG/1920] <thomas.marvin@monsanto.com>
Subject: FW: patent search

Hi Kay and Grant,

Great to see you both in person earlier this week.

I wanted to follow up with this search for synergy that we requested for confirmation Feb 14th, that we did not hear back. I wanted to see if at least one product could be confirmed as the cotton growers really need this product for the south immediately based upon the pressure that they are seeing.

Cotoran® 4L Herbicide	66222-181	Fluometuron (41.7%)
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For this AI we have conducted our search and can self-certify that there are no patents with Dicamba related to synergy. Please can you provide guidance on this so that we can proceed with submission of wind tunnel testing.

Finally, were you or Grant able to follow up on the volatility study for RU Xtend (premix) to get an estimate of timing for this product??

Thanks

Tina Bhakta Ph.D.
Global Chemistry Expansion Lead, Regulatory

From: BHAKTA, TINA [AG/1000]
Sent: Monday, March 20, 2017 3:23 PM
To: Montague, Kathryn V. <Montague.Kathryn@epa.gov>
Subject: FW: patent search

Kay

This was the search I was referring too. Initially requested Feb 14th.

Thank you!

Tina Bhakta Ph.D.

Global Chemistry Expansion Lead, Regulatory

From: BHAKTA, TINA [AG/1000]

Sent: Thursday, February 16, 2017 10:01 AM

To: 'Kenny, Daniel' <Kenny.Dan@epa.gov>

Cc: 'Montague, Kathryn V.' <Montague.Kathryn@epa.gov>; 'Rowland, Grant' <Rowland.Grant@epa.gov>

Subject: RE: patent search

Dan and Kay

Do you think we will hear back on this search today?

Thank you

Tina Bhakta Ph.D.

Global Chemistry Expansion Lead, Regulatory

From: BHAKTA, TINA [AG/1000]

Sent: Tuesday, February 14, 2017 10:12 AM

To: Kenny, Daniel <Kenny.Dan@epa.gov>

Cc: Montague, Kathryn V. <Montague.Kathryn@epa.gov>; Rowland, Grant <Rowland.Grant@epa.gov>

Subject: RE: patent search

Dan,

Thank you for the confirmation. Based on how the EPA has looked for the specific combinations that will be applied, there will be a few more products that we will need to add, as in some cases it will not be the individual two way combination that we will be testing but the formulated product might contain 2 AIs and thus when combined with dicamba it might become a 3-way combination and will need to be search for on that basis.

Product	EPA reg No	Active Ingredient Composition
Authority® Maxx Herbicide	279- 9560	Sulfentrazone (62.12%) / Chlorimuron Ethyl (3.88%)
Cotoran® 4L Herbicide	66222- 181	Fluometuron (41.7%)
Authority® MTZ Herbicide	279- 3340	Sulfentrazone (18.0%) / Metribuzin (55.0%)
Authority® XL Herbicide	279- 3413	Sulfentrazone (62.22%) / Chlorimuron Ethyl (7.78%)
Fierce®	59639- 193	Flumioxazin (33.5%) / Pyroxasulfone (42.5%)
Authority Assist	279- 3330	Sulfentrazone (33.33%) / Imazethapyr (6.67%)
Fierce XLT	59639- 194	Chlorimuron (6.67%) / Flumioxazin (24.57%) / Pyroxasulfone (31.17%)

Thanks

Tina Bhakta Ph.D.

Global Chemistry Expansion Lead, Regulatory

From: Kenny, Daniel [<mailto:Kenny.Dan@epa.gov>]

Sent: Monday, February 13, 2017 5:17 PM

To: BHAKTA, TINA [AG/1000] <tina.bhakta@monsanto.com>

Cc: Montague, Kathryn V. <Montague.Kathryn@epa.gov>; Rowland, Grant <Rowland.Grant@epa.gov>

Subject: RE: patent search

Hello Tina. We are able to confirm that the specific combinations listed immediately below do not have claims of synergy granted by the Patent and Trademark Office:

1. DICAMBA + SULFENTRAZONE + CLORANSULAM-METHYL
2. DICAMBA + PROMETRYN
3. DICAMBA + LACTOFEN
4. DICAMBA + FOMESAFEN
5. DICAMBA + FLUMIOXAZIN
6. DICAMBA + FLUMIOXAZIN + CHLORIMURON ETHYL
7. DICAMBA + CLETHODIM
8. DICAMBA + PYRITHIOBAC SODIUM
9. DICAMBA + ACETOCHLOR
10. DICAMBA + ACETOCHLOR + FOMESAFEN
11. DICAMBA + SULFENTRAZONE
12. DICAMBA + CLORANSULAM-METHYL
13. DICAMBA + CHLORIMURON ETHYL
14. DICAMBA + METRIBUZIN
15. DICAMBA + DIURON
16. DICAMBA PENDIMETHALIN

Once wind tunnel tests confirm acceptable results for one of the above combinations, that combination may be added to the website as an acceptable tank mix partner (provided, of course, that the tank mix partners are registered for these uses).

Please let me know if you have any questions or need clarification.

Regards,
Dan Kenny

From: BHAKTA, TINA [AG/1000] [<mailto:tina.bhakta@monsanto.com>]

Sent: Tuesday, February 07, 2017 9:56 PM

To: Kenny, Daniel <Kenny.Dan@epa.gov>

Cc: Montague, Kathryn V. <Montague.Kathryn@epa.gov>; Rowland, Grant <Rowland.Grant@epa.gov>

Subject: RE: patent search

Monsanto conducted a search of the US Granted Patent Collection utilizing the Derwent World Patents Index (DWPI) available via Thomson Innovation on September 8, 2016. All text fields in the patent were searched for the keywords dicamba and synerg*.

As described in the synergy paper we submitted the following filters were applied and not considered

- Dicamba + non-herbicide pesticide
- Dicamba + pesticide combination not in claim and no data present
- Dicamba + potential future tank mix partner not in claim but data is present
- Dicamba + herbicide not listed as tank mix partner in claim

We focused on those patent search hits containing those active ingredients that are contained in the final formulated products that we would like approved. The following is the list of tank mix partners that came up with no hits when this type of search was conducted. Dan indicated that you would be driving a confirmation that these active ingredients in the highlighted in the table can be cleared for synergy based on the fact that they come up with no hits. I have also added more 3 more actives that we would like for you to confirm as well as we have intentions of enabling more products that contain the following active ingredients;

metribuzin

diuron

pendimethalin

Product Name	EPA Registration Number	Active Ingredient Composition
Authority® First	279-3246	Sulfentrazone (62.1%)
		Cloransulam-methyl (30.0%)
Caparol® 4L	100-620	Prometryn (44.4%)
Cobra®	59639-34	Lactofen (24%)
Flexstar® / Reflex®	100-1101 / 100-993	Fomesafen (22.1%) / Fomesafen (22.8%)
Rowel™	59639-524	Flumioxazin (51%)
Rowel™ FX	59639-117-524	Flumioxazin (30.0%)
		Chlorimuron ethyl (10.3%)
Select MAX®	59639-132	Clethodim (12.6%)
Staple® LX	352-613	Pyriithiobac sodium (33.6%)
Warrant®	524-591	Acetochlor (33.0%)

Warrant® Ultra	524-620	Acetochlor (31.1%)
		Fomesafen (6.6%)

Dan indicated that you would be working on this and would confirm all of the active ingredients in the list and table show no synergy hits prior to Friday. Please let me know if you have any questions. I look forward to you confirming these for us.

Thanks

Tina Bhakta Ph.D.
Global Chemistry Expansion Lead, Regulatory

From: BHAKTA, TINA [AG/1000]
Sent: Monday, February 06, 2017 10:58 AM
To: 'Kenny, Daniel' <Kenny.Dan@epa.gov>
Subject: RE: patent search

Dan,

When do you think we will be able to hear back from you particularly on those actives where there are no patent hits. We will be waiting for confirmation from you to indicate that the actives that have no patents hits with dicamba from synergy stand point that these are good to go. Also the rationale that we have provided for you for some of the other products that do have a hit.

Thanks

Tina Bhakta Ph.D.
Global Chemistry Expansion Lead, Regulatory

From: BHAKTA, TINA [AG/1000]
Sent: Thursday, February 02, 2017 3:16 PM
To: Kenny, Daniel <Kenny.Dan@epa.gov>
Subject: patent search

Dan,

I have attached the patent search that we provided you and the search contained 15 A.I.s and the list of herbicide products that we want to initially enable as tank mix partners for 2017 with our Xtendimax product. The two products highlights contain actives that have come up with patent hits. Can you confirm that the rest of the products are cleared from a synergy stand point and that the rationale that we have provided for the other two products fits with EPAs exclusion criteria to also potentially clear them also. This patent paper was submitted to the agency on Dec 5th 2016.

	EPA Registration Number	
Product Name		Active Ingredient Composition
Authority® First	279-3246	Sulfentrazone (62.1%)
		Cloransulam-methyl (30.0%)

Caparol® 4L	100-620	Prometryn (44.4%)
Cobra®	59639-34	Lactofen (24%)
Fierce®	59639-193	Flumioxazin (33.5%)
		Pyroxasulfone (42.5%)
Flexstar® / Reflex®	100-1101 / 100-993	Fomesafen (22.1%) / Fomesafen (22.8%)
Roundup PowerMax®	524-549	Glyphosate (39.42%)
Rowel™	59639-524	Flumioxazin (51%)
Rowel™ FX	59639-117-524	Flumioxazin (30.0%)
		Chlorimuron ethyl (10.3%)
Select MAX®	59639-132	Clethodim (12.6%)
Staple® LX	352-613	Pyrithiobac sodium (33.6%)
Warrant®	524-591	Acetochlor (33.0%)
Warrant® Ultra	524-620	Acetochlor (31.1%)
		Fomesafen (6.6%)

Tina Bhakta Ph.D.

Global Chemistry Expansion Lead, Regulatory

M: 314-369-5897

O: 314-694-8679

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Message

From: Jeffrey H Birk [jeffrey.birk@basf.com]
Sent: 4/25/2017 1:35:05 PM
To: Montague, Kathryn V. [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c50d485150734f6e85059d64dd80a353-Kathryn V. Montague]
CC: Rowland, Grant [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=5b004bc79f1f40b0a181a584a8c64495-Rowland, Grant]
Subject: Engenia premix with pyroxasulfone herbicide?

Hello Kay,

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- Pyroxasulfone herbicide is not volatile.
- Pyroxasulfone is non-ionic and is not formulated as a salt
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- There is no expectation that the volatility potential of this BAPMA salt of dicamba and pyroxasulfone herbicide premix will be different than Engenia.

Please let me know as soon as possible if EFED should disagree with this conclusion. Any required field flux studies will need to be conducted in 2017 to meet our 1Q18 submission target.

Thanks,

Jeff

Message

From: MARVIN, THOMAS [AG/1920] [thomas.marvin@monsanto.com]
Sent: 5/23/2017 8:42:59 PM
To: Montague, Kathryn V. [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c50d485150734f6e85059d64dd80a353-Kathryn V. Montague]
Subject: RE: Dicamba Updates?

Thx Kay.

----- Original Message -----

Subject: RE: Dicamba Updates?
From: "Montague, Kathryn V." <Montague.Kathryn@epa.gov>
Date: May 23, 2017, 3:41 PM
To: "MARVIN, THOMAS [AG/1920]" <thomas.marvin@monsanto.com>
Hi, Tom,

I do have a draft memo from them, just need to work out with Dan, Grant and EFED how much time we need to wrap everything up, then I'll get in touch with you about renegotiating. I confirmed we won't do public process on this one, so that makes it much faster.

Best Regards,
Kay

From: MARVIN, THOMAS [AG/1920] [mailto:thomas.marvin@monsanto.com]
Sent: Tuesday, May 23, 2017 4:38 PM
To: Montague, Kathryn V. <Montague.Kathryn@epa.gov>
Subject: RE: Dicamba Updates?

Thx Kay, and understand. Hopefully we can talk this week about #1. I am getting requests to escalate given the limited time to make 2018 production decisions.

Tom

----- Original Message -----

Subject: RE: Dicamba Updates?
From: "Montague, Kathryn V." <Montague.Kathryn@epa.gov>
Date: May 23, 2017, 12:21 PM
To: "MARVIN, THOMAS [AG/1920]" <thomas.marvin@monsanto.com>
Hi, Tom,

I didn't forget about you, just swamped. Trying to get answers for each of your questions, I will give you a call or email as soon as people have gotten back to me with the information.

Best Regards,
Kay

From: MARVIN, THOMAS [AG/1920] [mailto:thomas.marvin@monsanto.com]
Sent: Friday, May 19, 2017 3:23 PM

To: Montague, Kathryn V. <Montague.Kathryn@epa.gov>

Subject: Dicamba Updates?

Kay,

Can we connect by phone today or early next week to touch base on: 1) status/PRIA for Roundup Xtend; 2) status of Roundup Xtend baseline query per my 5/6 email; 3) Dan mentioned last week that EPA had some label revisions to Xtendimax I should contact you about; and 4) status of outstanding synergy assessments for Xtendimax tank mixes per my 5/8 email. Our biggest priority is #1.

Thanks,

Tom

Tom Marvin
Director, Federal Regulatory Affairs
1300 I Street, NW
Washington, DC 20005
Cell: 314-308-6836
Desk: 314-694-7901

This email and any attachments were sent from a Monsanto email account and may contain confidential and/or privileged information. If you are not the intended recipient, please contact the sender and delete this email and any attachments immediately. Any unauthorized use, including disclosing, printing, storing, copying or distributing this email, is prohibited. All emails and attachments sent to or from Monsanto email accounts may be subject to monitoring, reading, and archiving by Monsanto, including its affiliates and subsidiaries, as permitted by applicable law. Thank you.

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Sent: 5/23/2017 8:38:04 PM
To: Montague, Kathryn V. [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c50d485150734f6e85059d64dd80a353-Kathryn V. Montague]
Subject: RE: Dicamba Updates?

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Message

From: Jeffrey H Birk [jeffrey.birk@basf.com]
Sent: 5/23/2017 11:59:12 AM
To: Montague, Kathryn V. [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c50d485150734f6e85059d64dd80a353-Kathryn V. Montague]
CC: Rowland, Grant [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=5b004bc79f1f40b0a181a584a8c64495-Rowland, Grant]
Subject: RE: Engenia premix with pyroxasulfone herbicide?

Good Morning Kay,

Just checking to see if you had a chance to get a decision from EFED on the need for field flux data with a dicamba premix that would not be expected to be different from Engenia alone?

Thanks,

Jeff

From: Montague, Kathryn V. [mailto:Montague.Kathryn@epa.gov]
Sent: Tuesday, April 25, 2017 2:48 PM
To: Jeffrey H Birk <jeffrey.birk@basf.com>
Cc: Rowland, Grant <Rowland.Grant@epa.gov>
Subject: RE: Engenia premix with pyroxasulfone herbicide?

Hi, Jeff,

I'll need to run this by EFED. They pretty much require a standard set of data for everything with these uses/products, so I'm not sure you'll be able to not do the field flux testing, but I will let you know what they say.

Best Regards,
Kay

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To: Montague, Kathryn V. <Montague.Kathryn@epa.gov>
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Please let me know as soon as possible if EFED should disagree with this conclusion. Any required field flux studies will need to be conducted in 2017 to meet our 1Q18 submission target.

Thanks,

Jeff

Message

From: MARVIN, THOMAS [AG/1920] [thomas.marvin@monsanto.com]
Sent: 5/19/2017 7:22:41 PM
To: Montague, Kathryn V. [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c50d485150734f6e85059d64dd80a353-Kathryn V. Montague]
Subject: Dicamba Updates?

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Thanks,

Tom

Tom Marvin
Director, Federal Regulatory Affairs
1300 I Street, NW
Washington, DC 20005
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Message

From: CUBBAGE, JERRY W [AG/1000] [jerry.w.cubbage@monsanto.com]
Sent: 2/9/2017 11:43:49 PM
To: Montague, Kathryn V. [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c50d485150734f6e85059d64dd80a353-Kathryn V. Montague]; Rowland, Grant [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=5b004bc79f1f40b0a181a584a8c64495-Rowland, Grant]
CC: NYANGULU, JAMES M [AG/1920] [james.m.nyangulu@monsanto.com]
Subject: HRM Educational plan submission for Xtendimax with VaporGrip Technology (EPA Reg. No. 524-617)
Attachments: 8570-1_Application.524-617.pdf; Cover letter_M1768 Herbicide_EducationalPlan.pdf; Xtendimax_Educational_Plan_on_HRM1 .pdf

Kay and Grant,

Good evening, I tried today to submit our Educational Plan on Herbicide Resistance Management per the Terms and Condition of Registration Appendix D for Xtendimax with VaporGrip Technology uses on dicamba tolerant soybeans and cotton (EPA Reg. No. 524-617, Decision No. 522837, 516207, and 511766) and the Educational plan got corrupted in the upload to the electronic submission portal. I will have our document specialist try the upload tomorrow again.


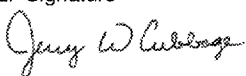
Please find a courtesy copy of the cover letter, 8570-1 form, and Educational Plan.

Please let me know that you have received these documents at your earliest convenience.

Thanks
Jerry

*Jerry W. Cubbage, Ph.D.
Monsanto Company
800 N. Lindbergh Blvd.
C3518N/C3NA
Creve Coeur, MO 63167
Office: 314-694-7350
Cell: 636-236-8894
Email: jerry.w.cubbage@monsanto.com*

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 <div style="display: inline-block; text-align: center;"> United States Environmental Protection Agency Washington, DC 20460 </div>		<input type="checkbox"/> Registration <input type="checkbox"/> Amendment <input checked="" type="checkbox"/> Other	OPP Identifier Number
Application for Pesticide – Section I			
1. Company/Product Number Monsanto Company / 524-617		2. EPA Product Manager Kay Montague	
4. Company/Product (Name) Monsanto Company / M1768 Herbicide (XtendiMax™ with VaporGrip™ Technology)		PM # 23	<input type="checkbox"/> None <input type="checkbox"/> Restricted
5. Name and Address of Applicant (Include ZIP Code) Monsanto Company 1300 I (Eye) Street, NW – Suite 450 East Washington, DC 20005 <input type="checkbox"/> Check if this is a new address		6. Expedited Review. In accordance with FIFRA Section 3(c)(3) (b)(i), my product is similar or identical in composition and labeling to: EPA Reg. No. _____ Product Name _____	
Section – II			
<input type="checkbox"/> Amendment – Explain below. <input type="checkbox"/> Resubmission in response to Agency letter dated _____ <input type="checkbox"/> Notification – Explain below.		<input type="checkbox"/> Final printed labels in response to Agency letter dated _____ <input type="checkbox"/> "Me Too" Application. <input checked="" type="checkbox"/> Other – Explain below.	
Explanation: Use additional page(s) if necessary. (For section I and Section II.) Monsanto is submitting its Educational Plan on Herbicide Resistance Management per the Terms and Condition of Registration Appendix D for Xtendimax with VaporGrip Technology uses on dicamba tolerant soybeans and cotton (EPA Reg. No. 524-617, Decision No. 522837, 516207, and 511766).			
Section – III			
1. Material This Product Will Be Packaged In:			
Child-Resistant Packaging <input type="checkbox"/> Yes* <input type="checkbox"/> No * Certification must be submitted	Unit Packaging <input type="checkbox"/> Yes <input type="checkbox"/> No If "Yes" No. per Unit Packaging wgt. Container	Water Soluble Packaging <input type="checkbox"/> Yes <input type="checkbox"/> No If "Yes" No. per Package wgt. Container	2. Type of Container <input type="checkbox"/> Metal <input type="checkbox"/> Plastic <input type="checkbox"/> Glass <input type="checkbox"/> Paper <input type="checkbox"/> Other (Specify) _____
3. Location of Net Contents Information <input type="checkbox"/> Label <input type="checkbox"/> Container		4. Size(s) Retail Container	
		5. Location of Label Directions <input type="checkbox"/> On Label <input type="checkbox"/> On Labeling accompanying product	
6. Manner in Which Label is Affixed to Product		<input type="checkbox"/> Lithograph <input type="checkbox"/> Other _____ <input type="checkbox"/> Paper glued <input type="checkbox"/> Stenciled	
Section – IV			
1. Contact Point (Complete items directly below for identification of individual to be contacted, if necessary, to process this application.)			
Name James Nyangulu		Title Regulatory Affairs Manager	Telephone No. (Include Area Code) 202-383-2866
Certification I certify that the statements I have made on this form and all attachments thereto are true, accurate and complete. I acknowledge that any knowingly false or misleading statement may be punishable by fine or imprisonment or both under applicable law.			6. Date Application Received (Stamped)
2. Signature 		3. Title Regulatory Affairs Manager	
4. Typed Name Jerry W. Cubbage		5. Date February 9, 2017	

MONSANTO



MONSANTO COMPANY
1300 I (Eye) Street, NW
Suite 450 East
Washington, D.C. 20005
<http://www.monsanto.com>

February 9, 2017

Jerry W Cabbage, Ph.D.
Regulatory Affairs Manager
314-694-7350

Document Processing Desk (E-SUB)
Office of Pesticide Programs
U.S. Environmental Protection Agency
One Potomac Yard
2777 South Crystal Drive, Room S4900
Arlington, VA 22202-4501

Attention: Kathryn Montague
PM Team 23

Subject: Educational Program on Herbicide Resistance Management for Xtendimax™ with VaporGrip™ Technology use on Dicamba-Tolerant Soybeans and Cotton M1768 Herbicide, EPA Reg. No. 524-617: Decision No. 522837, 516207, and 511766

Dear Ms. Montague:

Monsanto is submitting its Educational Plan on Herbicide Resistance Management per the Terms and Condition of Registration Appendix D for Xtendimax with VaporGrip Technology uses on dicamba tolerant soybeans and cotton (EPA Reg. No. 524-617, Decision No. 522837, 516207, and 511766).

This education plan includes best management practices for weed management including practices to avoid selection for herbicide resistance and for managing existing population of herbicide resistant weeds. It includes: Roundup Ready Plus Program, Herbicide label, various external programs and activities, written communication to growers, and education program awareness to sales representatives.

This application is being submitted electronically and contains the following documents:

- This cover letter
- Application for Pesticide Registration – EPA Form 8570-1
- Educational Plan

Should you require any additional information or have any questions regarding this submission, please contact me by direct telephone (314)694-7350, or electronic mail at jerry.w.cabbage@monsanto.com or James M. Nyangulu at our Washington DC office (202)383-2866.

Sincerely,

Jerry W. Cabbage, Ph.D.
Regulatory Affairs Manager

cc: File copy

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M1768 Herbicide

Herbicide Resistance Management Plan

Educational / Informational Component

SUBMITTER

Jerry Cabbage

Author(s)

Michael Horak
Scott Burchette
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Plan Date

February 3, 2017

Registrant Address:

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800 N. Lindbergh Blvd.
St. Louis, MO 63167

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 - b. External Program Materials
 - c. Other Training Materials
 - d. Technology Use Guide

1. Background and Overview

As a Condition of Registration for M1768 herbicide the EPA communicated to Monsanto the following requirements for Education / Information:

1. *Develop and implement an education program for growers that includes the following elements:*
 - a) *The education program shall identify appropriate best management practices (BMP's), set forth under the Best Management Practices (BMP's) Component below, to avoid and control weed resistance, and shall convey to growers, the importance of complying with BMP's;*
 - b) *The education program shall include at least one written communication regarding herbicide resistance management each year, directed to users of M1768 herbicide for use over-the-top on dicamba tolerant soybean and cotton; and*
 - c) *You must make the education program available to MON sales representative for distribution to growers.*
2. *Provide EPA the original education program within three months of issuance of this registration.*

2. Educational Plan Approach and Elements

Monsanto's ongoing herbicide resistance management educational plan consists of diverse activities and materials including:

- a) Best management practices and education
 - i. Roundup Ready PLUS – Crop Management Solutions Program Including the Associated Website
 - ii. Herbicide Label
 - iii. Various External Programs and Activities supported, in part, by Monsanto
 - iv. Other Training Activities (both internal and external to Monsanto)
- b) Written communication to growers
 - i. Technology Use Guide
- c) Education program awareness to sales representatives

Descriptions of these activities and materials are provided in the following pages.

2.a.i. Best Management Practices and Education: Roundup Ready PLUS – Crop Management Solutions Program Including the Associated Website

Program Background

Roundup Ready PLUS Crop Management Solutions is Monsanto's marketing program designed to educate growers on stewardship practices in corn, soybean and cotton. These practices include best management practices for weed management including practices to avoid selection for herbicide resistance and for managing existing populations of herbicide resistant weeds. The "Roundup Ready PLUS" now encompasses Xtendimax™ with VaporGrip™ Technology herbicide products. The program originated in the mid- 2000's as a result of the agronomic impact of glyphosate resistant weeds across the United States. The program is designed to deliver a solutions-based approach via Roundup Ready PLUS that focuses on the use of residual herbicides in the crop cycle and uses the "Start Clean. Stay Clean" tagline as a core message. In 2016, over 70,000 growers representing over 55M acres across the United States were registered in the program and together received more than \$100M in incentives for the use of multiple herbicides with overlapping sites of action..

A basic principle of the program is that Monsanto partners with leading global herbicide suppliers to provide growers the right herbicide solutions, at a compelling price, to manage weeds including herbicide resistant weeds effectively. In addition to Monsanto branded herbicides, four key partners also provide herbicides in Roundup Ready PLUS. There are six broad geographic regions in the Roundup Ready PLUS program: Plains, Midwest, Northeast, Southeast, Southwest and Mid-South. A tailored herbicide recommendation as well as a set of specific herbicides are recommended for each geographic region.

The promotion and education strategy for Roundup Ready PLUS includes contact with growers via multiple media, to increase awareness of the benefits of the program. Monsanto uses those media to promote the benefits of using residual herbicides (an herbicide resistance management - best management practice) along with the incentives Monsanto offers for following this specific BMP. Monsanto simultaneously provides additional educational &

promotional materials to our retail partners who fulfill the elements of the program. Monsanto has Customer Account Managers, technical agronomists, and weed management technical development representatives who support and educate our retail and grower customers on the elements of the program and effective weed resistance management in general.

Current Program Details

Roundup Ready PLUS is built on three foundational elements: 1) Providing growers & retailers with top performing geographic specific weed management recommendations (*educational*); 2) providing growers & retailers up-to-date information on important agronomic topics affecting stewardship (*educational*); and 3) providing growers with incentives for using herbicide options endorsed by Roundup Ready PLUS (*financial*) (Figure 1).

Figure 1: The core messages and component of the RoundupReady PLUS program

START CLEAN. STAY CLEAN.

EXPERT RECOMMENDATIONS
Proven weed management solutions for your crop and region

CASH-BACK INCENTIVES
Incentives for using endorsed herbicides with
multiple, effective sites of action

STEWARDSHIP & EDUCATION
Up-to-date information on important agronomic topics

ROUNDUP READY PLUS
CROP MANAGEMENT SOLUTIONS

RoundupReadyPLUS.com

Roundup Ready PLUS recommendations are made through a variety of sources and they range in scope from broad geographic to local growing condition specific recommendations. The recommendations are made by regional and local technical agronomists who have extensive knowledge of and training in the area of weed science. Monsanto agronomists work with academics in local geographies to align the recommendations. The local recommendations are shared with Chemistry Account Managers and through local retailers who in turn share those recommendations with growers. An example of a geographical recommendation is in Figure 2. This screen shot is an example recommendation for both soybeans and corn in the Midwest and is published in the Roundup Ready PLUS Midwest regional brochure. Each recommendation includes information for a cropping season.

Figure 2: Example recommendations in the RoundupReady Plus program

ROUNDUP READY PLUS
WEED MANAGEMENT SOLUTIONS

EXPERT RECOMMENDATIONS FOR WEED MANAGEMENT *in the Midwest*

1. **SCOUT FIELDS** before and after each herbicide application
2. **START CLEAN** with burndown or tillage
3. Use multiple overlapping residual herbicides pre-emergence **AND** postemergence to help **START CLEAN** and **STAY CLEAN**
4. Use tank mixes of products with **MULTIPLE, EFFECTIVE SITES OF ACTION***

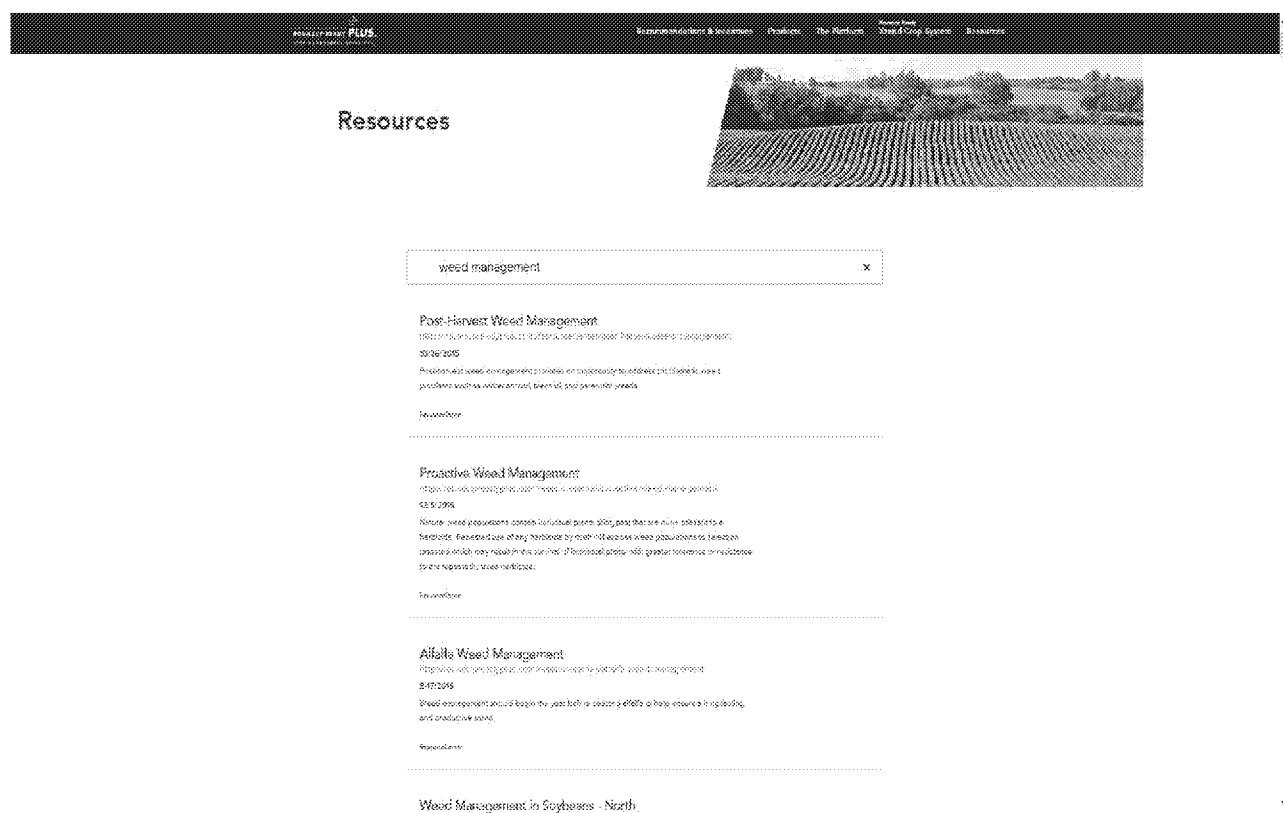
	TILLAGE	ROUNDUP READY 2 YIELD SOYBEANS	ROUNDUP READY 2 XTEND SOYBEANS
STAY CLEAN	BURNDOWN/ TILLAGE	Roundup WeatherMAX® + 2,4-D	Roundup WeatherMAX + 2,4-D
	PRE	Rowdy® FX Herbicide	Rowdy FX Herbicide
	POST 1	Roundup WeatherMAX + Soybean® Ultra Herbicide	Roundup WeatherMAX + "superior" technology† followed by...
	POST 2	Roundup WeatherMAX + Warrior® Herbicide + Lubron®	Roundup WeatherMAX + Warrior Ultra Herbicide + Axiom
	PRE/POST	Tank mix Select Max® to control volunteer corn, or other problem grasses	Tank mix Select Max to control volunteer corn, or other problem grasses
TOTAL SEASONAL OPPORTUNITY	\$12.00^A PER ACRE (2015)	\$10.50^A PER ACRE (2015)	

This is an example recommendation to your area.
For additional options, visit us at RoundupReadyTDS.com

*Weed control with Roundup Ready Xtend® technology and Roundup Ready 2 Yield® technology is not guaranteed. Please refer to product label and Roundup Ready 2 Yield Xtend soybean label for more information.

In addition to the Roundup Ready PLUS brochures and media advertisements that are used, Monsanto provides educational resources on <http://www.roundupreadyplus.com/>. The official Roundup Ready PLUS website is the central repository for all materials related to herbicide resistant weed management, key agronomic practices with weed management best management practices, and geographic recommendations. The website is updated on a regular basis. Figure 3 is an example of a few of the many informational materials from <http://www.roundupreadyplus.com/> that a farmer would find if they searched the topic of weed management. See appendix for additional examples.

Figure 3. Screen shot of example of some of the information from a search for “Weed Management” on the <http://www.roundupreadyplus.com/> website



Lastly, in order to encourage retailers to support and growers to act on the information published, Monsanto and it's Roundup Ready PLUS partners provide incentives on residual

herbicides. In order for grower to earn incentives through Roundup Ready PLUS, growers must use overlapping residual herbicides with multiple sites of action (a weed resistance management best practice). Monsanto and its partners paid more than \$100M in 2016 in incentives to support this best management practice.

2.a.ii. Best Management Practices and Education: The Herbicide Label

Another aspect of Monsanto's Herbicide Resistance Education program is encompassed by messaging and communication associated with the actual herbicide labels of XtendimaxTM with VaporGripTM Technology. Monsanto's herbicide labels provide a concise source of technical information about each specific herbicide and describe recommendations and Best Management Practices for the use of these products. The Herbicide Labels serve as an important communication/education material for the herbicide user. Specifically herbicide labels have sections to address Weed Resistance Management and reinforce best management practices that include delaying the development and controlling existing populations of herbicide resistant weeds.

Herbicide labels accompany all end use products and are therefore available to all users of the herbicide technologies.

As an example, the text for the XtendimaxTM with VaporGripTM label for soybeans is:

WEED RESISTANCE MANAGEMENT

Some naturally occurring weed biotypes that are tolerant (resistant) to dicamba may exist due to genetic variability in a weed population. Where resistant biotypes exist, the repeated use of herbicides with the same sites of action can lead to the selection for resistant weeds. Certain agronomic practices can delay or reduce the likelihood that resistant weed populations will develop and can be utilized to manage weed resistance once it occurs.

Do not use less than 22 fluid ounces per acre (0.5 lb a.e./A) of this product in a single application. Using the appropriate application rate can minimize the selection for resistant weeds.

Proactively implementing diversified weed control strategies to minimize selection for weed populations resistant to one or more herbicides is a best practice. A diversified weed management program may include the use of multiple herbicides with different sites of action and overlapping weed spectrum with or without tillage operations and/or other cultural practices. Research has demonstrated that using the labeled rate and directions for use is important to delay the selection for resistance.

The continued effectiveness of this product depends on the successful management of the weed resistance program; therefore, it is very important to perform the following actions.

To aid in the prevention of developing weeds resistant to this product, the following steps should be followed where practical:

- *Scout fields before application to ensure herbicides and rates will be appropriate for the weed species and weed sizes present.*
- *Apply full rates of XtendiMax™ With VaporGrip™ Technology for the most difficult to control weed in the field at the specified time (correct weed size) to minimize weed escapes.*
- *Scout fields after application to detect weed escapes or shifts in weed species.*
- *Report any incidence of non-performance of this product against a particular weed species to your Monsanto retailer, representative or call 1-844-RRXTEND.*
- *If resistance is suspected, treat weed escapes with a herbicide having a site of action other than Group 4 and/or use non-chemical methods to remove escapes, as practical, with the goal of preventing further seed production.*

Additionally, users should follow as many of the following herbicide resistance management practices as is practical:

- *Use a broad spectrum soil-applied herbicide with other sites of action as a foundation in a weed control program.*
- *Utilize sequential applications of herbicides with alternative sites of action.*
- *Rotate the use of this product with non-Group 4 herbicides.*
- *Avoid making more than two applications of dicamba and any other Group 4 herbicides within a single growing season unless mixed with another mechanism of action with an overlapping spectrum for the difficult to control weeds.*
- *Incorporate non-chemical weed control practices, such as mechanical cultivation, crop rotation, cover crops and weed-free crop seeds, as part of an integrated weed control program.*
- *Thoroughly clean plant residues from equipment before leaving fields suspected to contain resistant weeds.*
- *Manage weeds in and around fields, during and after harvest to reduce weed seed production.*

Contact the local agricultural extension service, Monsanto representative, agricultural retailer or crop consultant for further guidance on weed control practices as needed.

The information contained in the herbicide label is an important part of any weed resistance management educational plan and serves to reinforce best management practices for product use and to preserve the efficacy of the product.

2.a.iii. Best Management Practices and Education: Various external programs and activities supported, in part, by Monsanto

A further part of Monsanto's Herbicide Resistance Education program is encompassed by Monsanto's commitment to support educational activities conducted by third parties. Monsanto supports many 3rd party educational efforts and herein we describe three of those efforts conducted by the Weed Science Society of America (WSSA), the United Soybean Boards' "Take Action" program and the Herbicide Resistance Action Committee. The support offered may be financial, technical contributions, and/or people resources.

Monsanto is a sustaining member of the **Weed Science Society of America** providing significant financial support. The Weed Science Society of America, a non-profit professional society, promotes research, education, and extension outreach activities related to weeds; provides science-based information to the public and policy makers; and fosters awareness of weeds and their impacts on managed and natural ecosystems. The WSSA has extensive training and educational material on herbicide resistance, including management of existing populations of herbicide resistant weeds and delaying selection for herbicide resistance. Educational materials from WSSA can be found at <<http://wssa.net/wssa/weed/resistance/>>. These materials include fact sheets, infographics, training modules and scientific publications on delaying the selection for and managing populations of herbicide resistant weeds. See appendix for examples.

Monsanto supports the efforts of the United Soybean Board's "Take Action" initiative. This initiative, started by the United Soybean Board and now supported by other commodity groups and companies provides a broad range of educational and informational materials on herbicide resistance management. Educational materials from Take Action can be found at <http://takeactiononweeds.com/>. These materials include infographics, useful tools, fact sheets and posters to address various aspects of herbicide resistant weed management. See appendix for examples.

Monsanto is an active member and supporter of the Global Herbicide Resistance Action Committee (HRAC). Global HRAC is a cross-industry committee that works to promote education and research on herbicide resistance. A major effort of Global HRAC is the International Survey of Herbicide Resistance website <<http://www.weedscience.org/>> that provide significant scientific & educational information on herbicide resistant weeds in the United States and throughout the World. In addition Global HRAC also maintains a website <<http://www.hracglobal.com/>> that provides significant information that is used by others working on herbicide resistance management education and research. See appendix for examples.

2a.iv. Best Management Practices and Education: Other training activities (both external and internal to Monsanto)

Each year Monsanto supports and conducts various training activities with internal and external stakeholders. Although the specific activities vary from year to year, herbicide resistance management is a topic which is emphasized in these training activities. See appendix for examples.

Over the last few years training on herbicide resistance management has been part of various activities including:

Multimedia campaigns to educate farmers about the Roundup Ready Xtend system. Herbicide resistance management is a critical part of this system. The communication and education took place through informational advitorials, follow-a-field videos, radio interviews, magazine articles and through other social media such as Twitter. Additionally, growers were offered webinar-style training on weed management in the Roundup Ready Xtend Crop system.

Pesticide Applicator Education programs are supported by providing informational resource material on weed management and herbicide resistance management best practices. The programs supported are both regional and national pesticide applicator education programs.

Internal sales support, our chemistry account managers, agronomists and technology development representatives receive training on the Roundup Ready Plus Crop Management Solutions program. In addition, Monsanto focuses resources to “train the trainers” and we offer training to agriculture retail partners such as GrowMark and Helena in order to train their applicators, dealers and distributors.

Trade shows such as Farm Progress, The Commodity Classic and other state trade shows are used to highlight important best management practices for weed management including herbicide resistance management.

Support is provided to academic and extension educators for programs on weed management including herbicide resistance management.

In summary, Monsanto has an extensive training program among weed control stakeholders regarding the prevention and management of herbicide resistant weeds.

2.b.i. Written Communication to growers: The Technology Use Guide

As part of our written communication to growers, Monsanto’s Herbicide Resistance Education program also encompasses messaging and communication associated with our Technology Use

Guide (TUG). Growers agree to obtain and read before planting and strictly follow the applicable requirements of the The Technology Use Guide. The guide is available via a website http://www.monsanto.com/products/documents/2017_tug.010617final.pdf or if requested by mail. See appendix for examples.

Monsanto's TUG provides a concise source of technical information about Monsanto's current portfolio of technology products and sets forth recommendation or Best Management Practices for the use of these products.

In the Technology Use Guide Monsanto communicates its commitment to Stewardship of our products which includes our herbicides and their sustained use. "Monsanto Company is committed to enhancing grower productivity and profitability through the introduction of new agriculture biotechnology traits and other products. These new technologies bring enhanced value and benefits to growers, and growers assume responsibilities for proper management of these products."

The TUG has specific sections to address Weed Management, Weed Management Recommendations that include best practices for weed control including delaying the development and controlling existing populations of herbicide resistant weeds, and specific sections on weed management in Xtendflex Cotton and Roundup Ready 2 Extend Soybeans (See appendix).

2.c. Education program awareness to sales representatives

Monsanto conducts training of our sales force throughout the year. The Sales force is aware of the various educational components that are focused on preventing the selection for herbicide resistant weeds and managing existing populations of herbicide resistant weeds. The training in part encompasses information about the RoundupReady PLUS program and associated updates, the Technology Use Guide (a written communication to growers), and updates to the herbicide labels all of which are components of our overall education program. Internal sales support, our chemistry account managers, agronomists and technology development representatives receive training on the Roundup Ready Plus Crop Management Solutions program and in turn provide educational material to dealers, distributors and directly to farmers.

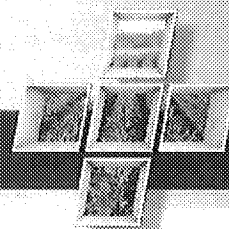
3. Appendix - Example Materials

Roundup Ready PLUS – Crop Management Solutions

- **Name:** Proactive Weed Management. **Emphasis:** Best Management Practices for herbicide use to avoid the selection for herbicide resistant weeds
- **Name:** Educational page from Expert Recommendations for Weed Management in the Midwest – Soybeans. **Emphasis:** Specific information on weed management best practices and specific herbicide recommendations to achieve the best management practices and receive an incentive.
- **Name:** Educational page from Expert Recommendations for Weed Management in the Midsouth – Cotton. **Emphasis:** Specific information on weed management best practices and specific herbicide recommendations to achieve the best management practices and receive an incentive.
- **Name:** Minimizing Weed Seed Transfer at Harvest. **Emphasis:** A best management practice for reducing the spread of herbicide resistant biotypes.
- **Name:** Kochia – a Weed to Watch. **Emphasis:** Information about the weed and what is know about its control, biology and potential for development of herbicide resistance.

Name: Proactive Weed Management.

Emphasis: Best Management Practices for herbicide use to avoid the selection for herbicide resistant weeds



PROACTIVE WEED MANAGEMENT

What You'll Learn...

- Proactive weed management is the timely use of herbicides and cultural practices to minimize the risk of herbicide-resistant weed development.
- Strategies that use residual herbicides along with timely post-emergence applications, multiple sites of action, and maintaining good weed control throughout the season will help reduce the risk of herbicide-resistant weed pressure on the farm.
- Implementing effective proactive weed management strategies can help to minimize the spread of glyphosate-resistant weeds, and the increased costs associated with their control.

Herbicide-resistant Weeds

Natural weed populations contain individual plants (biotypes) that are more tolerant to a herbicide. Repeated use of any herbicide by itself will expose weed populations to selection pressure which may result in the survival of individual plants with greater tolerance or resistance to the repeatedly used herbicide. If these plants are not controlled by another herbicide or cultural practice, the herbicide-resistant biotype can reproduce and spread.

Impact of Glyphosate-resistant Weeds

The development of resistant weed species and weed shifts typically increase control costs, when compared with previously susceptible weed populations.¹ If not properly managed, a small isolated glyphosate-resistant weed patch can soon spread across an entire field and potentially into neighboring fields. Depending on the crop, a limited number of post-emergence (POST) herbicide options may be available for in-crop control of glyphosate-resistant weeds. In some fields, growers have resorted to applying herbicides with hooded sprayers or hiring crews to hand hoe the weeds. Advancements have been made in hooded sprayer technology; however, weeds within the row will still need to be controlled. Depending on the region and

weed density, hand-hoeing weeds can be very expensive. These measures add costs to production, but still can be a part of managing weeds successfully.

The development of herbicide resistant weeds is not restricted to certain regions or as a result of raising certain crops. Growers are faced with the challenge of dealing with and learning to manage herbicide-resistant weeds with many herbicide groups. Implementing effective management strategies, will not only benefit your fields, but will also minimize the risk of spreading weeds to neighboring farms.

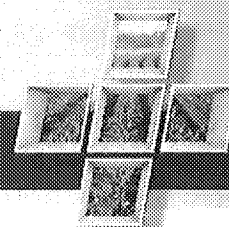
Proactive Weed Management Strategies

An economic analysis of weed management strategies shows that proactive strategies are particularly important for tough-to-control weeds such as waterhemp, giant ragweed and common lambsquarters.²

- **Using Herbicides with Residual Activity and Multiple Sites of Action in the Same Growing Season** - Residual herbicides can provide early-season weed control and allow for better timing of POST herbicide applications. A soil residual herbicide should always be incorporated into a weed management program for corn, soybean, and cotton production. Incorporating other herbicides with multiple sites of action into glyphosate POST programs can help to reduce weed population shifts.
- **Applying Herbicides at Full Rates** - Herbicides should be applied at their full labeled rate, as lower rates may allow weed escapes or may "select" for herbicide tolerance.
- **Eliminating Weeds Prior to Planting** - Weeds will begin to compete with a crop for water, nutrients, and sunlight at emergence. It is best to start the season with a weed-free field. Once a crop is established, fewer herbicide options may be available to control certain weed species.

(Continued on page 2)

PROACTIVE WEED MANAGEMENT



(Continued from page 1)

- **Controlling Weeds When They Are Small** - POST applications should be made before weeds reach 4 inches tall because larger weeds are more difficult to control.
- **Maintaining Good Weed Control Throughout the Season** - Providing excellent weed control, especially until canopy closure, can help provide clean fields through harvest. Weeds present at or above the crop canopy are more likely to outcompete and reduce yield potential. Any weed that sets seed will contribute to the seed bank in that field and may result in seed being transported to other fields via harvest equipment. Residual herbicides applied preplant and pre-emergence (PRE) may not provide effective weed control throughout the crop growing season. Overlapping residuals with approved in-crop applications of residual herbicides can pick up where PRE treatments begin to break down.
- **Using Glyphosate Best Management Practices** - Glyphosate applications should always be made at the right time and the right rate. To reduce the selection pressure for resistant plant biotypes, herbicides with different sites of action or tillage should always be incorporated into a weed management program. Growers that have implemented season-long weed control programs by including a preplant or PRE residual herbicide followed by an early POST herbicide in a Roundup Ready® system are reducing the risk of selecting for herbicide-resistant weed pressure on their farm.
- **Scouting and Monitoring Fields** - After herbicide applications, always scout fields to ensure weed control. If any escapes are found, either spot spray or remove the weed by hand. If the weed escape has already set seed, the best option is to bag the weed and remove it from the field. Always clean

machinery before moving between fields to prevent the spread of weed seed. Weeds in ditch banks, field borders, and along roadsides should also be controlled as weeds can easily spread into adjacent fields.

- **Rotating to Other Crops** - Rotating crops allows for different weed management and cultural practices. Crop rotation can allow for tillage, the use of other cultural practices, and the use of different herbicide programs which can help prevent certain weed species from becoming dominant in a field.

The Economics of Delaying Managing Herbicide Resistant Weeds - Proactive approaches will protect yield potential, which must be taken into account in any economic analysis. A proactive weed management plan helps minimize the risk of developing weed resistance on your farm. Being diligent in your activities can go a long way to maintaining your profitability.

Roundup Ready PLUS® Crop Management Solutions were developed by Monsanto in conjunction with leading academics and industry partners to help growers improve weed control, especially to improve control of tough-to-manage and glyphosate-resistant weeds. The Roundup Ready PLUS® web site includes weed management recommendations by crop and by geography, including the use of residual herbicides that provide multiple sites of action for controlling tough weeds, and other weed control resources. Visit the website at www.RoundupReadyPLUS.com.

Sources: ¹Mueller, T.C., Mueller, P.D., Young, B. G., and Culpepper, A.S. 2005. Proactive versus reactive management of Glyphosate-resistant or -tolerant weeds. *Weed Technology* 19(4):924-933. ²Boerboom, C. and Mitchell, P. 2005. Can proactive herbicide resistance management pay? *University of Wisconsin Crop Manager*. Web sources verified 11/15/2016.

For additional information, contact your local seed representative. Developed in partnership with Technology, Development & Agronomy by Monsanto.

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Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

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Name: Educational page from Expert Recommendations for Weed Management in the Midwest – Soybeans.

Emphasis: Specific information on weed management best practices and specific herbicide recommendations to achieve the best management practices and receive an incentive.

EXPERT RECOMMENDATIONS

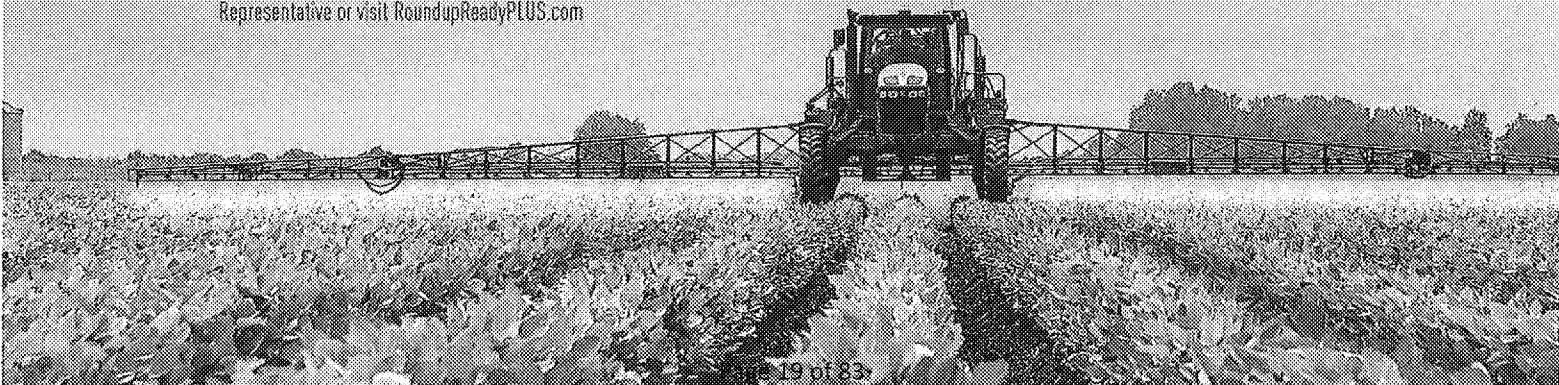
FOR WEED MANAGEMENT *in the Midwest*

1. **SCOUT FIELDS** before and after each herbicide application
2. **START CLEAN** with burndown or tillage
3. Use multiple overlapping residual herbicides pre-emergence AND postemergence to help **START CLEAN** and **STAY CLEAN**
4. Use tank mixes of products with **MULTIPLE, EFFECTIVE SITES OF ACTION***

TRAIT		genuity ROUNDUP READY 2 YIELD SOYBEANS	ROUNDUP READY 2 XTEND SOYBEANS
START CLEAN	BURNDOWN/ TILLAGE	Roundup WeatherMAX® + 2,4-D	Roundup WeatherMAX + 2,4-D
	PRE	Rowel® FX Herbicide	Rowel FX Herbicide
STAY CLEAN	POST 1	Roundup WeatherMAX + Warrant® Ultra Herbicide	XtendiMax™ herbicide with VaporGrip™ Technology* — followed by — Roundup WeatherMAX + Warrant Ultra Herbicide + AMS
	POST 2	Roundup WeatherMAX + Warrant® Herbicide + Cobra®	
	OTHER	Tank mix Select Max® to control volunteer corn or other problem grasses	
TOTAL INCENTIVE OPPORTUNITY		\$ ^{CASH} UP TO 12.00/A CASH BACK IN SOYBEANS	\$ ^{CASH} UP TO 10.50/A CASH BACK IN SOYBEANS

This is an example recommendation for your area.
For additional options, talk to your Monsanto
Representative or visit RoundupReadyPLUS.com

*Tank mixes with XtendiMax™ with VaporGrip™ Technology are
not currently approved. Please refer to the product label and
www.xtendimaxapplicationrequirements.com for more information.







Name: Educational page from Expert Recommendations for Weed Management in the Midsouth – Cotton.

Emphasis: Specific information on weed management best practices and specific herbicide recommendations to achieve the best management practices and receive an incentive.

EXPERT RECOMMENDATIONS

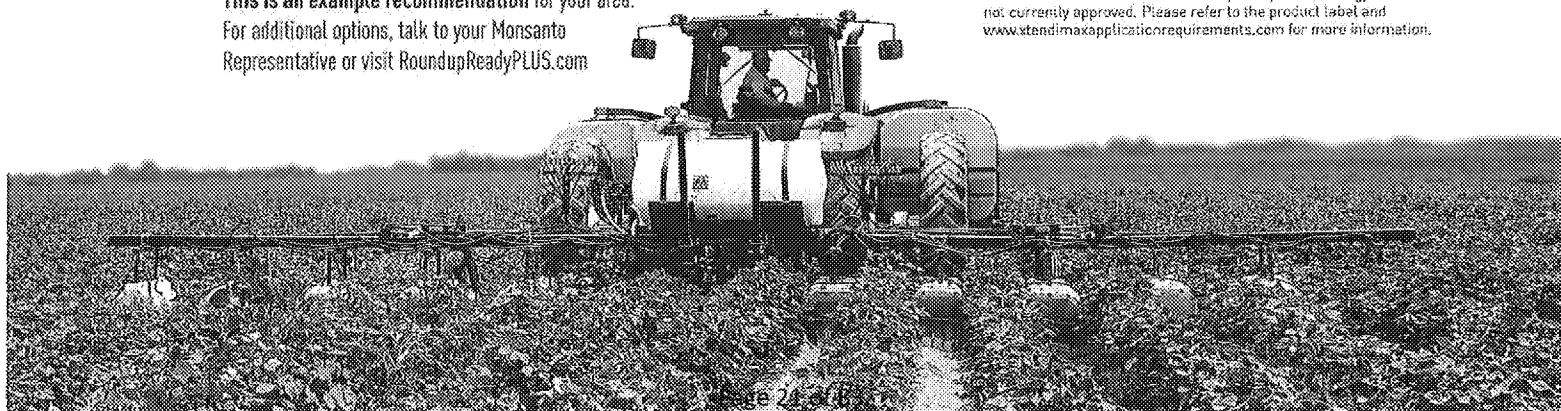
FOR WEED MANAGEMENT *in the Mid-South*

1. **SCOUT FIELDS** before and after each herbicide application
2. **START CLEAN** with burndown or tillage
3. Use multiple overlapping residual herbicides pre-emergence AND postemergence to help **START CLEAN** and **STAY CLEAN**
4. Use tank mixes of products with **MULTIPLE, EFFECTIVE SITES OF ACTION***

			
START CLEAN	BURNDOWN	Roundup PowerMAX® II + Rowel® Herbicide + dicamba or 2,4-D	Roundup PowerMAX II + dicamba or 2,4-D
	PRE-PLANT	-	-
STAY CLEAN	PRE	Warrant® Herbicide + fluometuron + Gramoxone® SL 2.0	Warrant Herbicide + fluometuron + Gramoxone SL 2.0
	POST 1	Roundup PowerMAX II + Warrant Herbicide	Roundup PowerMAX II or Liberty® + Warrant Herbicide
	POST 2	Roundup PowerMAX II + Dual Magnum®	XtendiMax™ herbicide with VaporGrip™ Technology*
	LAY-BY	Roundup PowerMAX II or MSMA + diuron	Roundup PowerMAX II or MSMA + diuron
TOTAL INCENTIVE OPPORTUNITY			

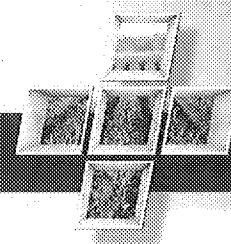
This is an example recommendation for your area.
For additional options, talk to your Monsanto Representative or visit RoundupReadyPLUS.com

*Tank mixes with XtendiMax™ with VaporGrip™ Technology are not currently approved. Please refer to the product label and www.xtendimaxapplicationrequirements.com for more information.



Name: Minimizing Weed Seed Transfer at Harvest.

Emphasis: A best management practice for reducing the spread of herbicide resistant biotypes.



MINIMIZING WEED SEED TRANSFER AT HARVEST

What You'll Learn...

- Weather conditions and challenges with weed control during a growing season may leave some fields weedy at harvest.
- Simple steps, such as harvesting weedy fields last and carefully cleaning harvest equipment between fields, can help minimize the spread of weeds, including herbicide-resistant biotypes.

Less than ideal weather conditions can lead to untimely herbicide applications resulting in higher than normal weed densities at harvest. Fall harvest is an important time to evaluate weed management programs. Always note the location of problematic weeds and take steps to minimize the transfer of weed seeds. Harvest equipment can greatly contribute to the spread of weed seeds across fields. Having a plan in place prior to harvest can potentially help minimize the spread of hard-to-control weeds.



Figure 1. Weeds present in soybeans at harvest.

Locate Weedy Fields Prior to Harvest

When feasible, harvest weedy fields and dense weedy areas of fields last. Harvesting these fields last can help to minimize the transfer of weed seed during harvest from weedy areas to weed-free areas. Weeds may also interfere with harvest because they often do not dry down with the crop and may clog harvesting equipment.

Clean Harvest Machinery

Harvesting equipment should be cleaned prior to first harvest use. Weed seed can be dispersed between fields by all harvesting equipment. Thoroughly clean all harvest equipment including combines, tractors, trucks, augers, and tarps. Be sure to reverse and clean augers. To help minimize the spread of weed seed, tractors and harvesting equipment should be cleaned prior to moving them from field to field. Weed seed can also move and be spread over large areas in soil that sticks to tractor and combine tires. The most common and efficient methods of cleaning equipment includes vacuuming, sweeping, and using compressed air or water.

The best way to prevent and protect your farm from weeds dispersed by harvesting equipment is to implement an effective weed management program.

The location of weedy areas should be documented at harvest to help develop a weed management plan for the following season. The plan should include strategies to identify problematic fields and develop cleaning procedures for all harvesting equipment.

By implementing and following this type of program, the potential for mechanical spread of weeds will be reduced.



Figure 2. When feasible, harvest fields with less weeds first.

Sources:

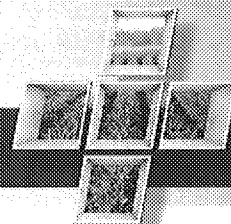
Bagavathiannan, M.V., Norsworthy, J.K., Scott, R.C., and Barber, T.L. The spread of herbicide resistant weeds: What should growers know? University of Arkansas Extension, FSA2171, <http://www.uaex.edu>. Menalled, F. 2014. Crop harvesting and weed management. Montana IPM Bulletin, Montana State University Extension, <http://pesticides.montana.edu>. Web sources verified 8/12/2015.

Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

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Name: Kochia – a Weed to Watch.

Emphasis: Information about the weed and what is know about its control, biology and potential for development of herbicide resistance.



KOCHIA - A WEED TO WATCH

What You'll Learn...

- Kochia is tough to control and an integrated management approach is needed for its control and to prevent the spread of resistance.
- Understanding the biology of kochia will help in developing management strategies for the weed.
- Kochia has shown a propensity for developing resistance to herbicides, including glyphosate.
- Crop rotation and the use of different herbicides are important management strategies for the control of kochia.

Kochia Biology

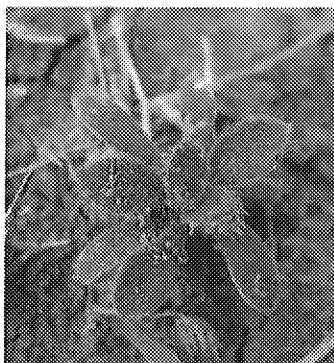


Figure 1. Kochia seedling.

Kochia (*Kochia scoparia*) is one of the most troublesome weeds across the Great Plains and western United States. It can be found in crop fields, pastures, rangeland, roadsides, ditch banks, and wastelands. It can be a major problem weed in chemical fallow, and cause severe yield

reductions in crops. Understanding the biology of kochia helps in developing management strategies for the weed.¹

Kochia is one of the earliest summer annual broadleaf weeds to germinate in the spring, and it will continue to germinate throughout the growing season. Kochia reproduces only by seeds, which will generally survive 1 to 2 years in the soil. Kochia seeds germinate at shallow soil depths.² Seedlings have thick, dull green leaves, and the undersides of kochia cotyledons on seedlings are usually bright pink or magenta in color (Figure 1). Young plants form a small rosette.³ Kochia is capable of germinating at colder soil temperatures and is quite tolerant of frost. Because kochia

germinates early, it can be in advanced stages of growth when other weeds are ready to spray.

Kochia grows rapidly and can reach 6 feet in height when grown in competition with other plants. Without competition, it can grow to be a bushy plant, typically reaching heights of 3 to 4 feet. Kochia plants develop many branches with stems that are often red-tinged. Leaves are lance-shaped, pale green, and covered with hairs (Figure 2). Kochia

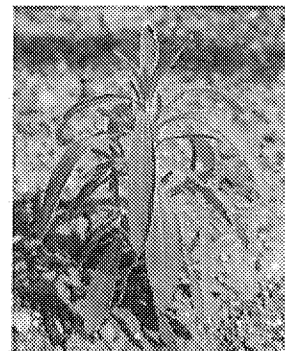


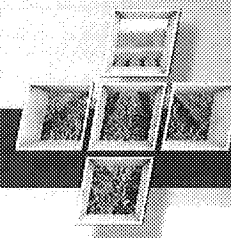
Figure 2. Kochia plant in early growth stage. At about 6 inches, the weed starts to develop branches, which can give it a bushy appearance.

flowers and sets seed in late summer and fall, with a single plant capable of producing up to 50,000 seeds, that can be spread by wind, water, equipment, and as contaminants in hay.¹ The seed is often dispersed after plants mature and become "tumbleweeds" dropping seeds as they blow around (Figure 3).

Kochia is tough to control because it is widely adapted, tolerates stress, emerges early with an extended germination period, has narrow leaves, and produces an abundance of seed that can spread over long distances. Kochia plants are tolerant of drought and saline soils, and do well under growing conditions considered poor for most crops. Seeds germinate at shallow soil depths, making no-till a good environment for kochia survival. Kochia plants can self- or cross-pollinate, increasing the likelihood of resistant genes moving across populations.



Figure 3. Post-harvest wheat stubble with an infestation of kochia. Photo courtesy of Dr. Phil Stahlman, Kansas State University.



KOCHIA - A WEED TO WATCH (continued)

Resistance to Herbicides

Kochia has an imperfect flower that allows cross-pollination, which has importance for the spread of herbicide resistance. Populations of kochia that are resistant to atrazine (photosystem II inhibitor) were first reported in 1976. Kochia resistance to sulfonylurea herbicides (ALS inhibitors) was first reported in 1987, and is now considered to be widespread. Biotypes resistant to synthetic auxins (dicamba, 2,4-D, fluroxypyr) were first reported in 1995. Populations with multiple resistance to ALS inhibitors and photosystem II inhibitors were also reported in 1995. Kochia populations resistant to glyphosate (EPSP synthase inhibitor) were first reported in 2007 in Kansas. Since 2007, glyphosate-resistant kochia has spread throughout many of the Great Plains and western states. Most recently, populations with multiple resistance to glyphosate and other herbicides were reported in 2013 in Montana and Kansas.⁴ Consequently, kochia requires an integrated management approach to prevent the spread of resistant plants.

Best Management Practices

Best management practices (BMPs) should be adopted for the containment and management of resistant weed populations.¹ This includes integration of cultural and mechanical weed management practices, and the use of diversified and effective control tactics with herbicides.

Crop rotation has been shown to be a significant factor for managing kochia. A multi-state university study has shown corn and soybean plants to compete well with kochia, suppressing growth and development.⁵ Corn and soybeans have more herbicide options for kochia management than other annual rotational crops. Wheat and fallow were less effective than corn or soybeans, and sugarbeets were found to be ineffective in suppressing kochia growth. Diverse crop rotations can include the use of multiple management tactics and herbicides with different sites of action for more effective control of kochia.

Using both preemergence (soil-residual) and postemergence herbicides with multiple sites of action is also an important management strategy to control kochia populations. Using multiple herbicide application timings (burndown, preplant, pre- and post-emergence, post-harvest) in-crop or fallow are the most effective means to control multiple flushes of kochia during the season.

Other BMPs include:

- Using tillage or physically removing kochia plants that escaped herbicide applications before those plants produce seed.
- Controlling kochia populations at field borders, fence lines, roadsides, and other non-crop areas to minimize movement into crop fields.
- Planting crop seeds that are certified and weed-free, and production practices that enhance crop competition against weeds like kochia.

Integrated Weed Management Principles

- Use multiple sites of action with overlapping weed spectrums in rotation, sequences, or mixtures.
- Use the full recommended herbicide rate and proper application timing for the most tough-to-control weed species in the field.
- Scout fields after herbicide application to ensure control has been achieved. Avoid allowing weeds to reproduce by seed or to proliferate vegetatively.
- Monitor site and clean equipment between sites.

Sources:

¹ Jha, P., McVay, K., Varanasi, A., and Kumar, V. 2013. Glyphosate-resistant kochia in Montana - Herbicide recommendations and best management practices for growers. Montana State University Extension Research Bulletin No. 4602.

² Schwinghammer, T.D., and Van Acker, R.C. 2008. Emergence timing and persistence of kochia. *Weed Science* 56:37-41.

³ Kochia weed gallery. University of California IPM program. <http://www.ipm.ucdavis.edu>.

⁴ Heap, I. The international survey of herbicide resistant weeds. <http://www.weedscience.org>.

⁵ Sandell, L. 2012. Glyphosate-resistant kochia confirmed in Nebraska. UNL CropWatch. <http://cropwatch.unl.edu>.

Web sites last verified 10/9/15.

This document is intended to provide information about this weed and guidelines for control. As a tough-to-control weed, knowledge about the biology and weed control programs will help in their management. For additional information, contact your local seed representative. Developed in partnership with Technology, Development & Agronomy by Monsanto.

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Appendix - Example Materials

External Monsanto Supported Programs

- Example of training module for the Weed Science Society of America (WSSA). **Name:** Principles of Managing Herbicide Resistance. **Emphasis:** Discusses various approaches to managing herbicide resistance. This is one of 5 modules on herbicide resistance developed by the WSSA.
- Examples of TakeAction materials.
 - **Name:** Field Identification of Resistance. **Emphasis:** How to identify potentially resistant weeds in the field.
 - **Name:** Best Management Practices for Herbicide Resistance. **Emphasis:** Lists the best management practices for delaying the selection for and managing populations of herbicide resistant weeds.
 - **Name:** Economic returns. **Emphasis:** Discusses the economic benefits of preventing the selection of herbicide resistant weeds.
- Example of Global Herbicide Resistance Management materials.
 - **Name:** Synthetic Auxin Resistant Weeds. **Emphasis:** Discusses the current status of weeds resistant to the auxinic herbicides including dicamba & herbicide resistance best management practices.

Example of training module for the Weed Science Society of America (WSSA).

Name: Principles of Managing Herbicide Resistance.

Emphasis: Discusses various approaches to managing herbicide resistance. This is one of 5 modules on herbicide resistance developed by the WSSA.

Principles of Managing Herbicide Resistance

Lesson 5

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1

Objectives

By the end of this lesson, you will:

Understand that diversity is an important concept in the management of herbicide-resistant weeds.



Identify the broad strategies and specific tactics for managing herbicide-resistant weeds.



Compare the value of proactive versus reactive management for herbicide-resistant weeds.



Above: Seedling stage of waterhemp, a weed that is known to be resistant to several herbicides.

Image number KB040-1 at the USDA-ARS online image gallery.



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2

Diversity of Practices

The best strategies to manage herbicide resistance in weeds are established on the concept of diversity.

Diversity can be achieved by:

Using mechanical, cultural, and biological practices in addition to herbicides

and

Applying several mechanisms of control (each target weeds)

Mechanical Cultural

Mechanism of action (MOA) is the biochemical site within a plant with which a herbicide directly interacts. Herbicides with different MOAs are identified by different group numbers. For example, 2,4-D is a group 4 herbicide, and glyphosate is a group 9 herbicide.

[Click to close.]

A combination of tactics reduces the selection pressure imposed by any single practice.



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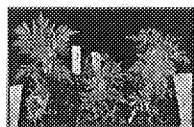
Management Strategies

Proactive management is the implementation of tactics before herbicide-resistant weeds are apparent.

PROACTIVE: before confirmation



Reactive management is the implementation of tactics after herbicide resistance has been confirmed in the field.



REACTIVE: after confirmation



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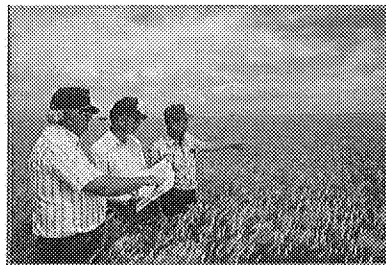
4

Proactive Management: Defined

Proactive management is a style of decision making that anticipates events or changes in the field, plans ahead for them, and should include weed management planning.

Examples of decisions to anticipate:

- ✓ Seed varieties and supply
- ✓ Equipment needs
- ✓ Fertilizer needs and availability
- ✓ Weed management



Above: Planning land management methods in a dryland cropping system.

Image number K5730-10 at the USDA-ARS online image gallery.



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5

Proactive Management

PROACTIVE: before confirmation

Proactive management in the context of herbicide-resistant weeds is critical for the long term sustainability of effective herbicide options in all crops.

Advantages of proactive management:

- ✓ Preserve crop yield potential
- ✓ Save money compared to reactive methods
- ✓ Prevent the need for dramatic, short-term shifts in farm practices
- ✓ Protect herbicide options for future operations



Common lambsquarters is found in many agricultural systems. It is known to be resistant to several herbicides.

Photo: image number 1891311 at image gallery www.invasive.org.



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6

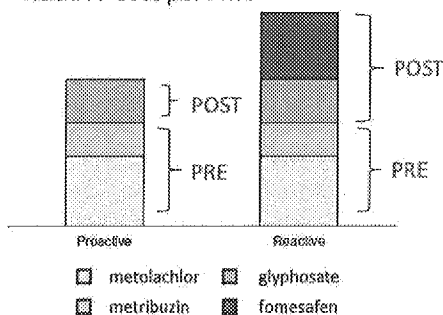
Proactive Management: Saves Money

Weed management decisions based on proactive management can be more cost-effective over time compared to programs based on reactive management.

Example

PROACTIVE Management Program: Roundup Ready® soybeans without glyphosate-resistant pigweeds		
Application	Product	Group Number(s)
PRE	metolachlor + metribuzin	15 + 5
POST	glyphosate	9
REACTIVE Management Program: Roundup Ready® soybeans with glyphosate-resistant pigweeds		
Application	Product	Group Number(s)
PRE	metolachlor + metribuzin	15 + 5
POST	glyphosate + fomesafen	9 + 14

Relative Cost per Acre



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7

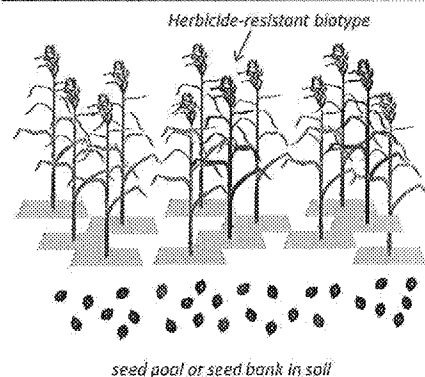
Progression of Weed Resistance

Weed resistance progresses logarithmically

Year 0

Credit: Mike DeFelice

Treatment	% Resistant Weeds in Population	Weed Control
0 Application	.0001	Excellent



After first application, the effect on individual survivors is that the seed pool increases



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8

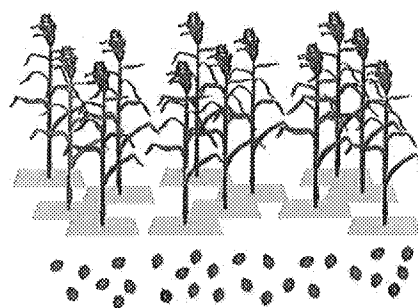
Progression of Weed Resistance

Weed resistance
progresses logarithmically

Year 6

Credit: Mike DeFelice

Treatment	% Resistant Weeds in Population	Weed Control
0 Application	.0001	Excellent
1 st Application	.00143	Excellent
2 nd Application	.0205	Excellent
3 rd Application	.294	Excellent



seed pool or seed bank in soil

Herbicide resistance cannot be reversed in a practical time frame. In many cases, the seed pool is unlikely to change back because there is no fitness penalty.

Control may still be maintained by using a different type of herbicide or by using a different type of control.



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9

Proactive Management Tactics

Strategies to **proactively** delay herbicide resistance can include one or more of the following tactics:



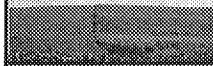
Herbicide	Mechanical	Cultural
 <ul style="list-style-type: none"> • Multiple herbicides with different mechanisms of action – Mixes – Sequence – Across seasons 	 <ul style="list-style-type: none"> • Tillage – Pre-plant – In crop cultivation – Post harvest 	 <ul style="list-style-type: none"> • Crop rotation • Plant population • Row spacing • Planting date • Fertilizer placement • Cover crops

Photo credits from left to right: Flickr (winfred); Deere Photo Library; Allianz



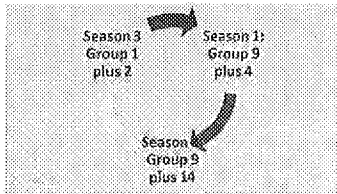
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10

Proactive Management: Herbicide Tactics

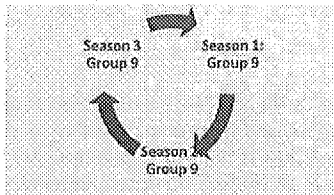
Herbicide choice requires *careful planning* so that products with different mechanisms of action (MOA), or unique group numbers, and activity on the same target weeds, are intentionally combined with each other or other weed control practices.

SUSTAINABLE



Repeated annual use of a herbicide with the same MOA in the absence of other MOAs or different management strategies can lead to resistance.

NOT SUSTAINABLE



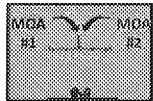
Note: For all herbicide applications, it is critical to apply the labeled rate at the correct time. Management strategies based only on a herbicide mechanism of action classification system, or herbicide group number, may not adequately address specific and local needs. Consult product labels and the assistance of your local extension specialist for more information.

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Proactive Management: Herbicide Tactics

The main schemes for applying herbicides with different mechanism of action (MOA) to manage herbicide resistance are:

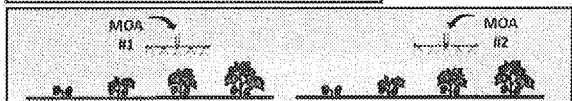
Mixture application



Sequentially throughout season



Across multiple seasons



These options can provide the flexibility to choose the best fit or combinations of fit for local agronomic operations.

Note: For all herbicide applications, it is critical to apply the labeled rate at the correct time. Management strategies based only on a herbicide mechanism of action classification system, or herbicide group number, may not adequately address specific and local needs. Consult product labels and the assistance of your local extension specialist for more information.

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Proactive Management: Herbicide Tactics

Tank mixing or the use of pre-mixed products with different mechanisms of action and activity on the same target weed or weeds can be effective at delaying the onset of herbicide-resistant weeds.

Herbicide mixtures contain more than one active ingredient.




Herbicide mixtures may be marketed as prepackaged formulations.

Note: For all herbicide applications, it is critical to apply the labeled rate at the correct time. Management strategies based only on a herbicide mechanism of action classification system, or herbicide group number, may not adequately address specific and local needs. Consult product labels and the assistance of your local extension specialist for more information.

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Proactive Management: Herbicide Tactics

Need for Full Label Rate

Definitions:

- "Labeled rate" = A rate or range of rates set by herbicide manufacturers to consistently provide effective control of weed species across growth stages and site conditions.
- "Low rate" = A rate applied below the labeled rate that may provide effective control at an individual location, but will not provide consistent control over a wide range of conditions.

Routine exposure to low herbicide rates can allow a portion of the weed population to survive, leading to the evolution of herbicide-resistant populations.

Weeds can be exposed to "low rates" due to:

- Intended use of low rates
- Spraying plants larger than those recommended on the label
- Inadequate coverage of weeds because of size, density and/or crop cover
- Inaccurate sprayer calibration, faulty or ineffective equipment, or mixing errors

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Proactive Management: Mechanical Tactics

Mechanical tactics include techniques such as:

- ✓ Pre-plant tillage
- ✓ Strip or zone-tillage
- ✓ In-crop cultivation
- ✓ Post-harvest mowing and/or tillage
- ✓ Hand-roguing before seed set



Photo: Image number K5197-3 at the USDA-ARS image gallery.

Equipment sanitation is also important to slow the spread of herbicide-resistant weeds and weed seeds.



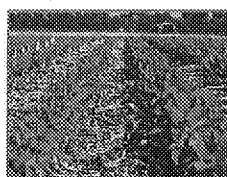
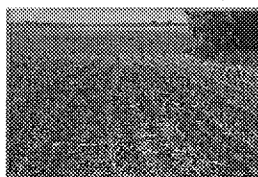
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Proactive Management: Cultural Tactics

Crop Management. Agronomic practices, such as choice of hybrid or variety, differences in planting times, fertilizer management, row spacing, plant populations, seed bed preparation, and harvesting techniques can influence the growth cycle of weed species and therefore provide an advantage to the crop. For example, narrow crop row spacing can quickly shade sensitive weed species, while longer periods of weed control are generally required for wider row spacings.



*Photo credits: Flickr
Monsanto*

Crop Rotation. Natural differences exist among the abilities of crops to compete with weeds. The greatest benefit in crop rotation comes as a result of the most diverse crop rotations, because they provide the greatest opportunities for exploiting differences in tillage practices, competitiveness, and herbicide choices.



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Proactive Management: Cultural Tactics

Cover Crops. Some cover crops, sown prior to the primary crop, may suppress weed growth through their physical presence or through the release of substances that can affect the germination and growth of some weed species.

Slowing the Spread of Herbicide-Resistant Populations. Managing weeds in the borders around fields before flowering is important to prevent pollen movement between resistant and susceptible plants. Preventing the movement of seeds and vegetative propagules from field to field by cleaning equipment before it is moved can slow the spread of herbicide-resistant weeds.

In general, cultural practices greatly influence the composition of weeds, and their germination and growth. These practices can also influence the amount of weed seed in the seed bank and the spread of herbicide-resistant weeds.



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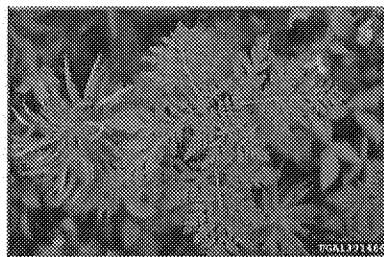
17

Reactive Management: Defined

Reactive management is a style of decision making that acts in response to events or changes in the field when they occur with little to no expectation or anticipation of the events or changes.

- ✓ A reactive action is a response to an unexpected problem.
- ✓ Reactive management is a necessary part of land management.
- ✓ There is no way to plan for everything that can possibly happen.

The proactive style of decision making is preferred in the context of herbicide-resistant weeds.



Above: Common ragweed, a weed that is known to be resistant to several herbicides. Photo: Image number 1391466 at Image gallery www.invasive.org.



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Reactive Management

REACTIVE: after confirmation

Reactive management can be utilized during two general times:

Tactics used within the same season a population has been identified as herbicide-resistant

or

Tactics used in seasons after a population has been identified as herbicide-resistant

The timing of the first reactive management tactics may affect the intensity and number of options necessary to manage herbicide-resistant weeds in the future.

Early detection and remediation prior to weed seed set within the same season (see above) will reduce weed density in subsequent years and can reduce weed management costs in later years.



Left: A small patch of glyphosate-resistant Palmer amaranth. Photo courtesy of Alan York, NCSU.



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Reactive Management: Same Season

Same season management tactics are generally limited and **may not be effective** when dealing with herbicide-resistant weed populations. Because situations can vary widely, consult your local extension specialist for advice.

Herbicide Options:

- Apply the most effective postemergence herbicide with a *different mechanism of action*.
- If low-level herbicide resistance has been identified, and **no other options are available**, apply the maximum labeled rate of the same postemergence foliar herbicide.

Mechanical Options:

- Cultivation or hand-roguing may be the primary options in some agronomic environments and geographies.

In general, these options are limited in their effectiveness because of larger weeds and/or crop stage limitations later in the season.



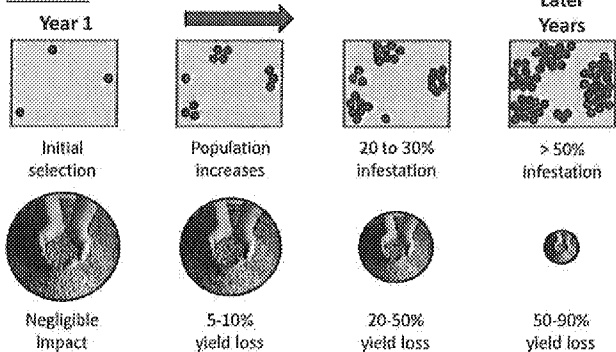
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Potential Yield Impact of the Failure to Manage Herbicide-Resistant Weed Populations

As a herbicide-resistant weed population increases in density and area, yield potential decreases.

Example



When herbicide-resistant weed management practices are implemented early, the risks associated with these losses can be reduced.



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Conclusions

- Strategies to manage herbicide resistance in weeds are best established on the concept of diversity.
- Management diversity can be achieved by using herbicides in mixtures, sequences, or rotation with and without the use of mechanical and cultural methods of weed management.
- Proactive management can be more cost effective and provide greater yield protection and income versus waiting to implement reactive strategies after herbicide-resistant weed populations are identified.



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Credits:

This lesson was developed by a WSSA sub-committee and reviewed by the WSSA Board of Directors and other WSSA members before being released. The sub-committee was composed of the following individuals.

- Wes Everman, PhD (North Carolina State University)
- Les Glasgow, PhD (Syngenta Crop Protection)
- Lynn Ingegneri, PhD (Consultant)
- Jill Schroeder, PhD (New Mexico State University)
- David Shaw, PhD (Mississippi State University)
- John Soteres, PhD (Monsanto Company) (Sub-committee chairman)
- Jeff Stachler, PhD (North Dakota State University and University of Minnesota)
- François Tardif, PhD (University of Guelph)

Financial support for this was provided by Global HRAC, North America HRAC, and WSSA.

Our thanks are extended to the National Corn Growers Association for allowing us to use training materials posted on their website as the starting point for these training lessons.



Examples of TakeAction materials.

Name: Field Identification of Resistance.

Emphasis: How to identify potentially resistant weeds in the field.

Name: Best Management Practices for Herbicide Resistance.

Emphasis: Lists the best management practices for delaying the selection for and managing populations of herbicide resistant weeds.

Name: Economic returns.

Emphasis: Discusses the economic benefits of preventing the selection of herbicide resistant weeds.

Field Identification and Control of Suspected Herbicide-Resistant Weeds

HERBICIDE RESISTANCE IS NO LONGER JUST A REGIONAL ISSUE. IT'S A NATIONAL THREAT.

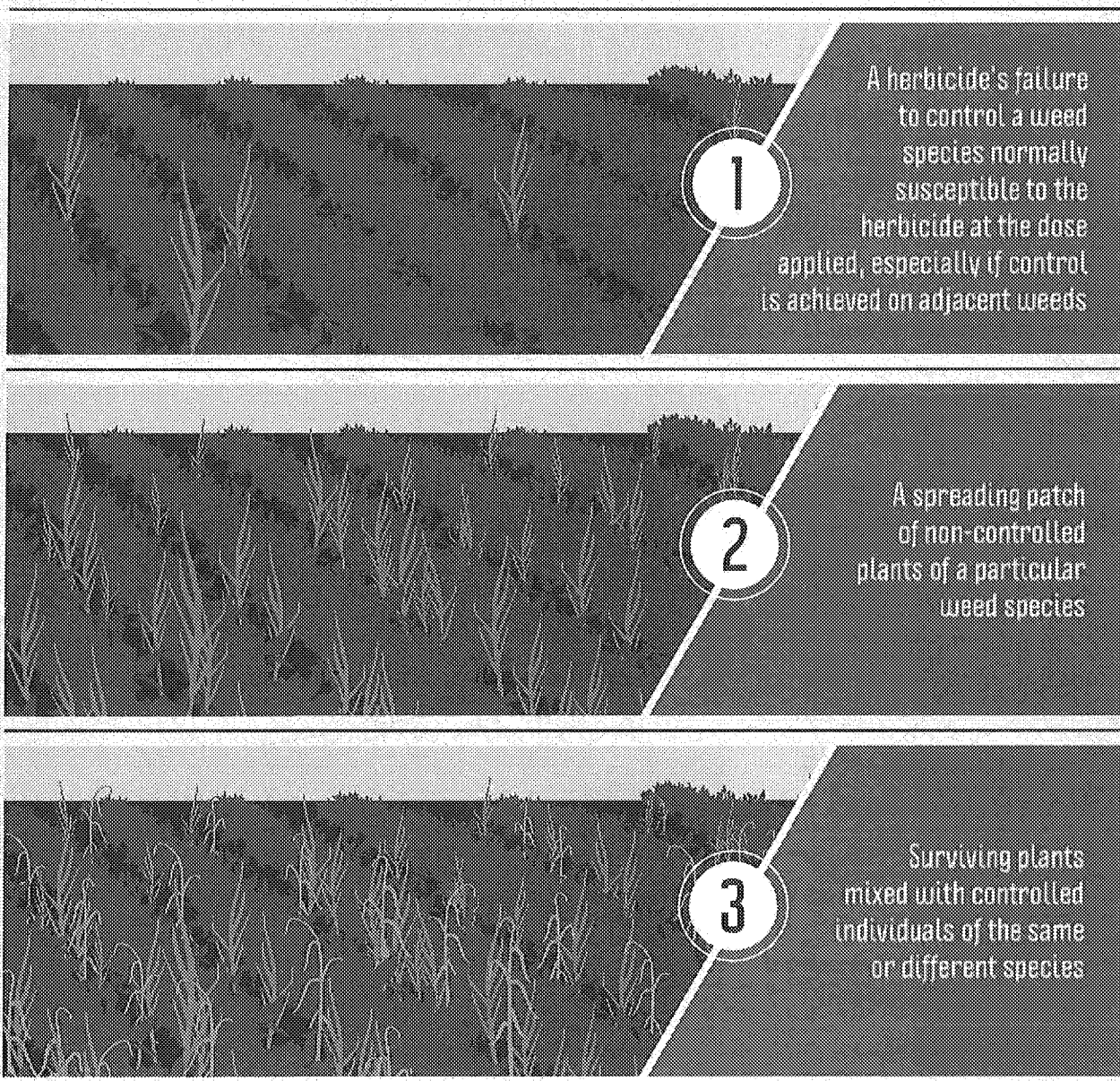
Though herbicide resistance has been an issue in parts of North America for many years, it's growing in severity. Farmers have become accustomed to a very efficient and simple weed management strategy – using a herbicide-resistant trait with the associated herbicide – but managing existing herbicide-resistant weeds or working to prevent the development of new ones requires farmers to consider more complex weed-management strategies. The occurrence of resistance on a farm can increase rapidly and proper identification and confirmation of resistance is imperative to timely mitigation.



Technical editing for this publication was led by a committee of the Weed Science Society of America (WSSA), and developed with funding from the soy checkoff.

What does resistance look like?

Three indicators of possible herbicide resistance:



The figure consists of three horizontal panels, each showing a field of soybean plants. The first panel shows a field where most plants are controlled, but there is a distinct, isolated patch of taller, uncontrolled weeds. The second panel shows a field where a large, irregular patch of uncontrolled weeds is spreading across the area. The third panel shows a field where surviving weeds are mixed in with the controlled soybean plants.

- 1** A herbicide's failure to control a weed species normally susceptible to the herbicide at the dose applied, especially if control is achieved on adjacent weeds
- 2** A spreading patch of non-controlled plants of a particular weed species
- 3** Surviving plants mixed with controlled individuals of the same or different species



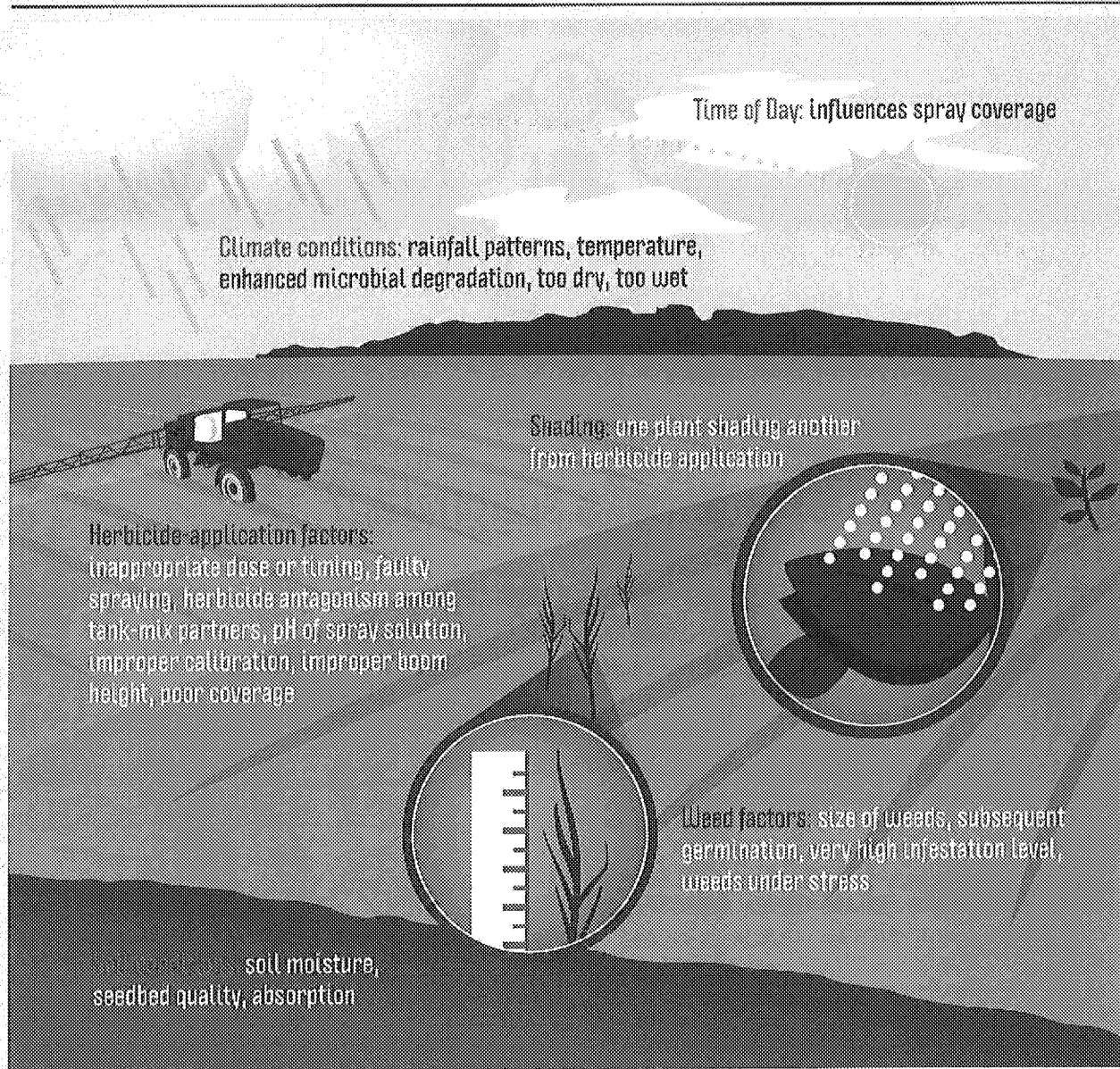
Field Identification and Control of Suspected Herbicide-Resistant Weeds

www.TakeActionOnWeeds.com

Technical editing for this publication was led by a committee of the Weed Science Society of America (WSSA), and developed with funding from the soy checkoff.

What causes herbicide failure?

9 out of 10 herbicide failures are due to factors other than resistance.

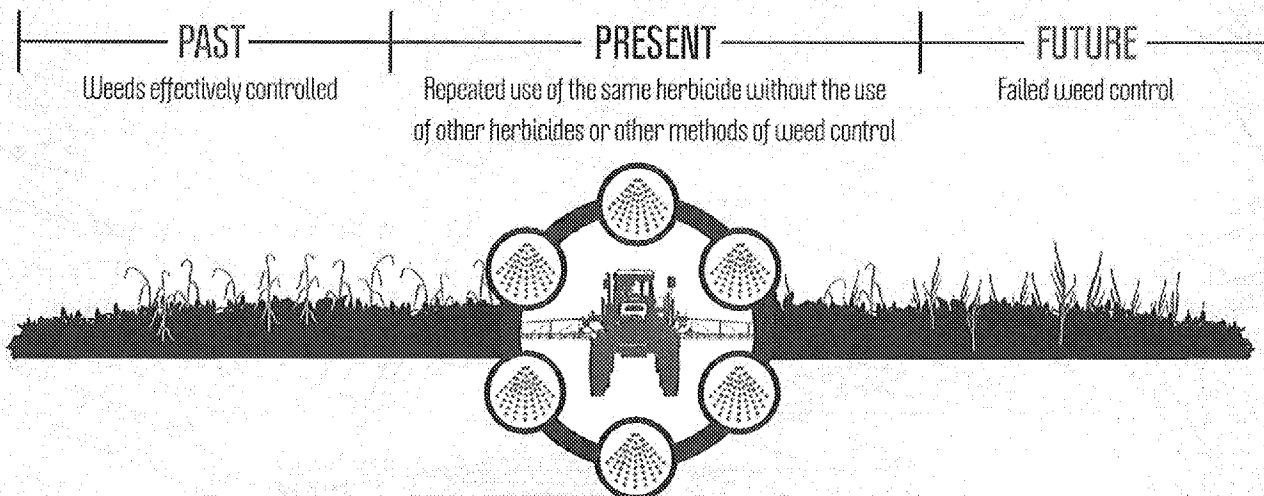


Field Identification and Control of Suspected Herbicide-Resistant Weeds

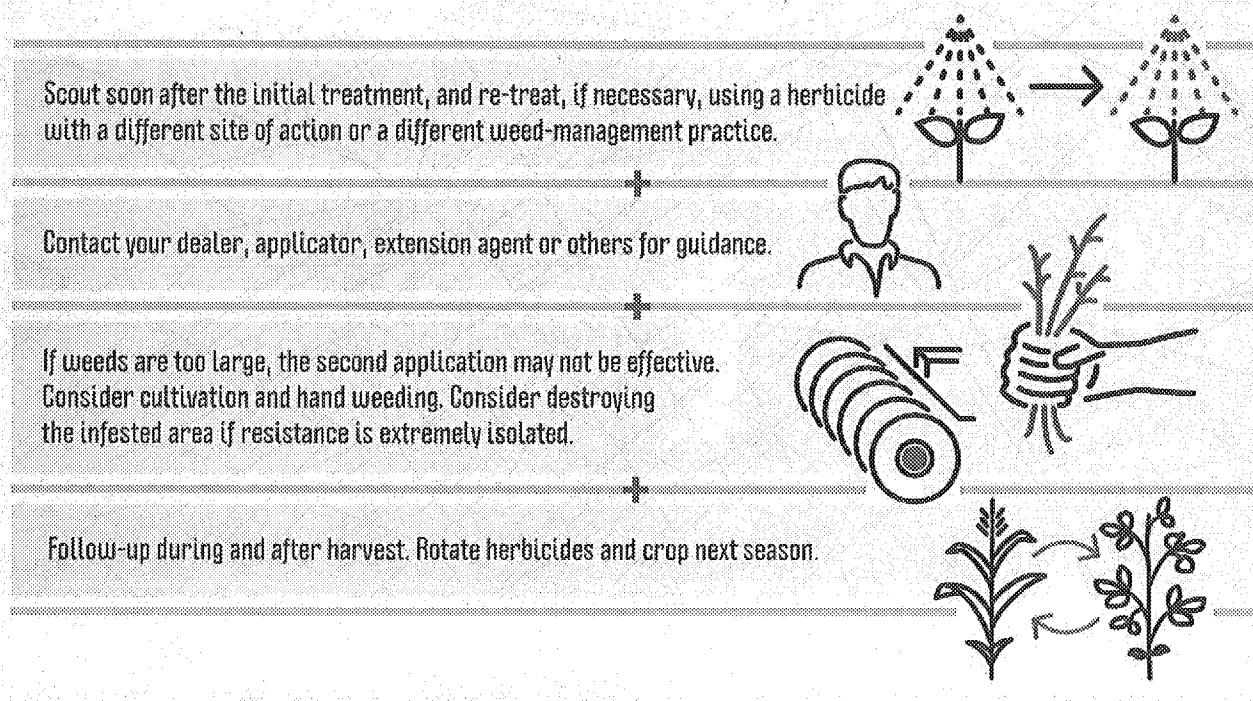
www.TakeActionOnWeeds.com

Technical editing for this publication was led by a committee of the Weed Science Society of America (WSSA), and developed with funding from the soy checkoff.

How does herbicide resistance occur?



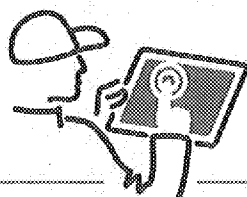
What should be done now if herbicide resistance is suggested?



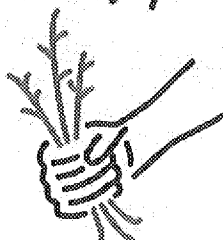
Technical editing for this publication was led by a committee of the Weed Science Society of America (WSSA), and developed with funding from the soy checkoff.

Best Management Practices for Herbicide Resistance

- 1 Understand the biology of the weeds present.



- 2 Use a diversified approach toward weed management. Focus on preventing weed-seed production and reducing the number of weed seeds in the soil seedbank.



- 3 Plant into weed-free fields and then keep fields as weed-free as possible.



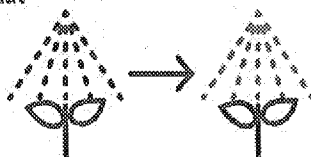
- 4 Plant weed-free crop seed.



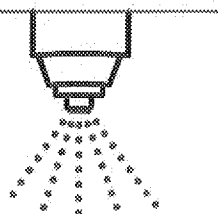
- 5 Scout fields routinely.



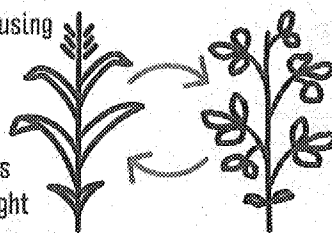
- 6 Use multiple herbicide modes of action (MOAs) that are effective against the most troublesome weeds or those most prone to herbicide resistance.



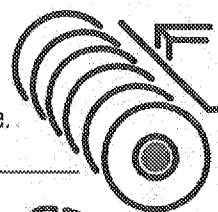
- 7 Apply the labeled herbicide rate at recommended weed sizes.



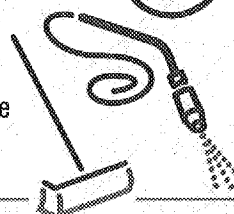
- 8 Emphasize cultural practices that suppress weeds by using crop competitiveness, meaning rapid-growing bushy crops do a better job of suppressing weeds than slow-growing upright crops that produce few leaves.



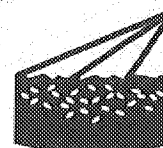
- 9 Use mechanical and biological management practices where appropriate.



- 10 Prevent field-to-field and within-field movement of weed seed or vegetative reproductive structures.



- 11 Manage weed seed at harvest and after harvest to prevent a buildup of the weed seedbank.

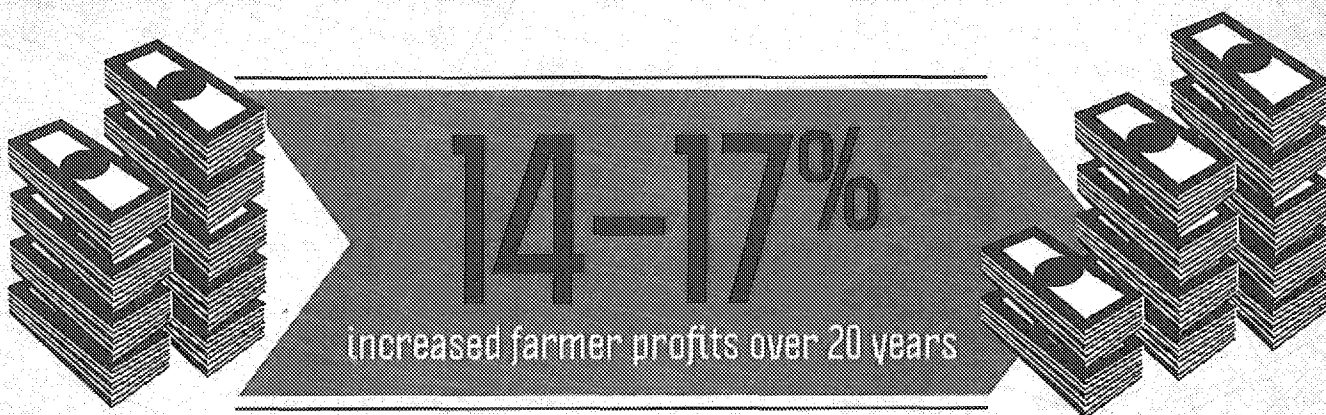


- 12 Prevent an influx of weeds into the field by managing field borders.

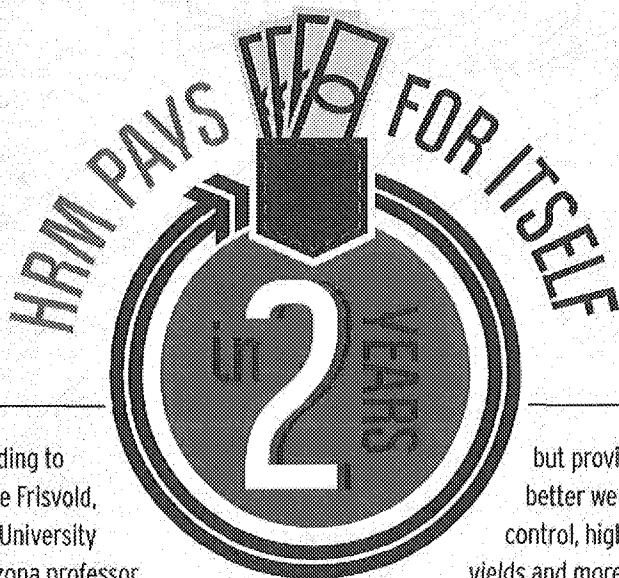


ECONOMIC RETURNS

to Herbicide Resistance Management (HRM)
of Horseweed (Marestail)



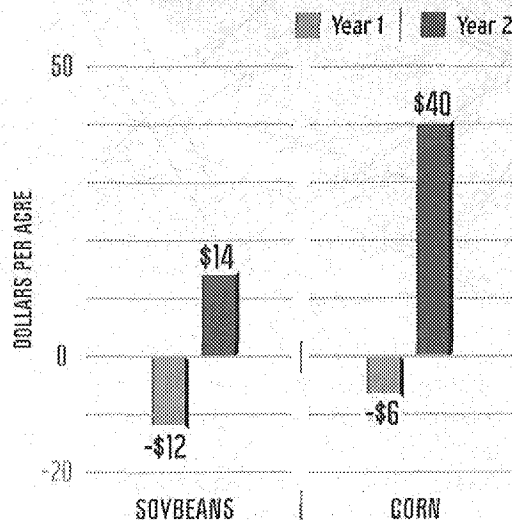
The results of an economic model exercise conducted through the Weed Science Society of America (WSSA), demonstrates that the benefits of proactive resistance management, specifically with horseweed, can be long-lived, and can substantially increase farm profits long-term. Depending on cropping system, proactive resistance management increased farmer profits 14-17 percent over a 20-year planning horizon. The following contains the results of this study as summarized by a committee of the WSSA.



According to George Frisvold, Ph.D., University of Arizona professor, proactive resistance management can pay for itself in as little as two years. Managing resistance can involve higher weed-control costs,

but provides better weed control, higher yields and more sales revenues. **Farmers can get their initial investment - and more - back in as little as two years.**

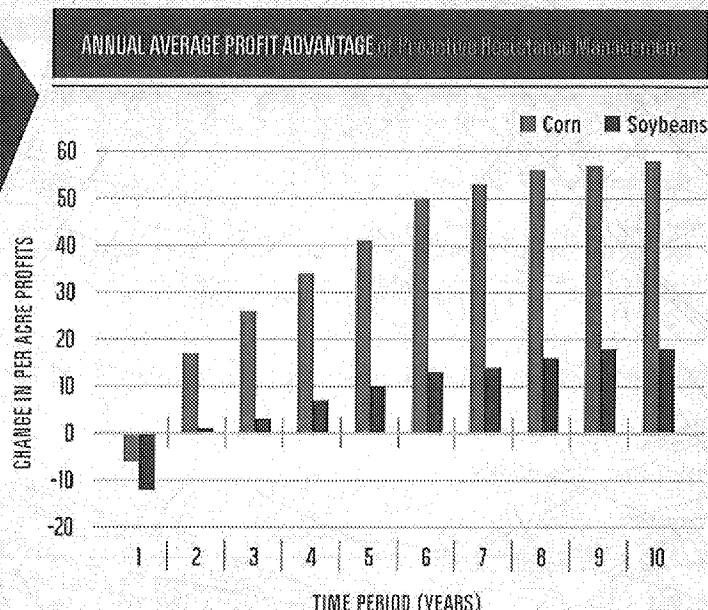
PROACTIVE WEED MANAGEMENT COSTS



A recent study found that, in its first year, proactive management can reduce soybean profits by \$12 per acre and corn profits by \$6 per acre. But by year two, profits were \$14 per acre higher for soybeans and \$40 per acre higher for corn. The extra profits in the second year more than make up for the lower profits in the first year.

CORN: Profit advantage over a three-year time period averages \$26 per acre per year, with a profit advantage of nearly \$60 per acre per year over a 10-year time period.

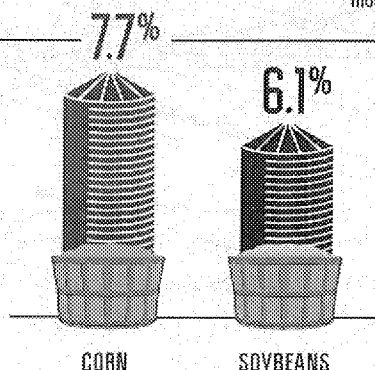
SOYBEANS: Profit advantage over a five-year time period averages \$10 per acre per year, with a profit advantage of almost \$20 per acre per year over a 10-year time period.



*These values are in constant (current) dollars, accounting for the fact that people place more weight on costs and benefits today than identical costs and benefits in the future.

HRM

GROWS YIELDS

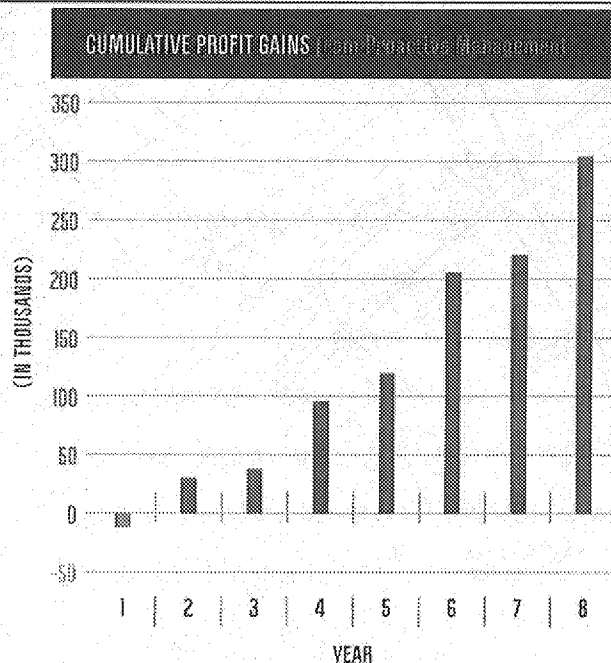


BETTER WEED CONTROL IS LEADING TO HIGHER LONG-RUN YIELDS. LONG-RUN AVERAGE YIELDS WHEN USING PROACTIVE WEED-MANAGEMENT PRACTICES WERE MORE THAN **6 PERCENT HIGHER** FOR SOYBEANS AND NEARLY **8 PERCENT HIGHER** FOR CORN.



**HRM
CUMULATIVE
PROFIT GROWS
AND GROWS**

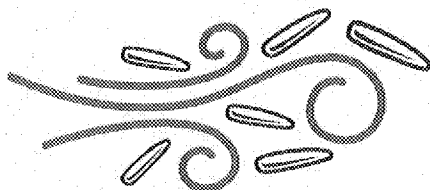
All farms are different and results will vary by farm. The chart at right shows the cumulative change in profits over eight years.* **After just 4 years on a 1,000-acre farm, profits would be more than \$95,000 greater!** This gain would surpass \$300,000 by the eighth year.



*The study assumed baseline yields (without weed damage) stayed the same and that corn, soybean, and chemical prices all rise with the rate of inflation. Applying the study results to a representative 1,000-acre farm in a corn-soybean rotation over 10 years would show impressive results. Assumptions about corn and soybean prices, herbicide costs, and other farm costs are listed in Appendix table 1-3 of the Livingston and others (2015) study. For more information, visit the USDA-ERS website.

HORSEWEED (MARESTAIL) FACTS

1 horseweed plant can produce up to **200,000 SEEDS** which are readily dispersed by wind.



Horseweed can germinate in the fall
AND CAN WITHSTAND WINTER COLD TO CONTINUE GROWING IN THE SPRING.
It can also germinate in the spring before planting.



For corn, soybeans or cotton, HORSEWEED IS PROBLEMATIC
in no-till or minimum-tillage situations
where herbicides are solely relied upon for weed management prior to planting.



**If not controlled prior to planting,
HORSEWEED CAN CAUSE SIGNIFICANT YIELD LOSS.**

Horseweed is **one of the 10 worst
herbicide-resistant weed species.**

In data, scientists have confirmed the plant's resistance to five different herbicide chemistries, including glyphosate, atrazine, paraquat, dicamba and alachlor.



Example of Global Herbicide Resistance Management materials.

Name: Synthetic Auxin Resistant Weeds.

Emphasis: Discusses the current status of weeds resistant to the auxinic herbicides including dicamba & herbicide resistance best management practices.

Synthetic Auxin Resistant Weeds

Available from the HRAC website: hracglobal.com



HERBICIDE
RESISTANCE
ACTION
COMMITTEE

Synthetic Auxin Resistant Weeds

Despite synthetic auxin herbicides being used longer and on a greater area than any other herbicide mechanism of action the area infested with synthetic auxin resistant weeds is low in comparison to many other herbicide mechanisms of action. Twenty seven weeds have evolved resistance to synthetic auxins. This excludes grasses resistant to quinclorac since the

biochemical mechanism of resistance in these cases appears to differ from other auxin resistance. Sixteen of the 27 species have documented resistance to 2,4-D, seven to MCPA, and six to dicamba. In the United States six weed species have evolved resistance to synthetic auxin herbicides, with only one, *Kochia scoparia*, being widespread and a serious economic problem. Globally the most important synthetic auxin resistant weeds are Kochia, Wild Radish, Corn poppy, and Wild

Mustard. Synthetic auxin resistance in two other species, tall waterhemp and common lambsquarters, are not widespread yet, but have the potential to become serious problems in the United States if they are not managed properly.

This fact sheet is an introduction to a series of fact sheets on auxin resistant weeds, covering kochia, wild radish, corn poppy, wild mustard, tall waterhemp, and common lambsquarters.

Table 1. The occurrence of synthetic auxin resistant weeds worldwide.

Species	First Year	Herbicides	Country
<i>Amaranthus tuberculatus</i>	2009	2,4-D	United States
<i>Carduus nutans</i>	1981	2,4-D	New Zealand
<i>Carduus pycnocephalus</i>	1997	2,4-D, MCPA, MCPB	New Zealand
<i>Centaurea cyanus</i>	2012	dicamba	Poland
<i>Centaurea solstitialis</i>	1988	picloram	United States
<i>Chenopodium album</i>	2005	dicamba	New Zealand
<i>Cirsium arvense</i>	1985	2,4-D, MCPA	Hungary, Sweden
<i>Commelina diffusa</i>	1957	2,4-D	United States
<i>Daucus carota</i>	1957	2,4-D	Canada, United States
<i>Descurainia sophia</i>	2011	MCPA	China
<i>Fimbristylis miliacea</i>	1989	2,4-D	Malaysia
<i>Galeopsis tetrahit</i>	1988	dicamba, fluroxypyr, MCPA	Canada
<i>Gallum aparine</i>	2014	fluroxypyr	China
<i>Gallum spurium</i>	1996	quinclorac	Canada
<i>Kochia scoparia</i>	1994	dicamba, fluroxypyr	United States
<i>Lactuca serriola</i>	2007	2,4-D, dicamba, MCPA	United States
<i>Limncharis flava</i>	1995	2,4-D	Indonesia, Malaysia
<i>Limnophila erecta</i>	2002	2,4-D	Malaysia
<i>Papaver rhoeas</i>	1993	2,4-D	Italy, Spain
<i>Ranunculus acris</i>	1988	MCPA	New Zealand
<i>Raphanus raphanistrum</i>	1999	2,4-D	Australia
<i>Sinapis arvensis</i>	1990	2,4-D, dicamba, dichlorprop, MCPA, mecoprop, picloram	Canada, Turkey
<i>Sisymbrium orientale</i>	2005	2,4-D	Australia
<i>Soliva sessilis</i>	1999	clopyralid, picloram, triclopyr	New Zealand
<i>Sonchus oleraceus</i>	2015	2,4-D	Australia
<i>Sphenoclea zeylanica</i>	1983	2,4-D	Malaysia, Philippines, Thailand
<i>Stellaria media</i>	1985	fluroxypyr, MCPA, mecoprop	China, United Kingdom

Rarity of Synthetic Auxin Resistant Weeds

Gressel and Segel (1982) suggested that the low incidence of synthetic auxin resistant weeds may be due to the auxinic herbicides having multiple sites of action, requiring multiple mutations within an individual to confer resistance. This seems a reasonable assumption, however in most cases (*Sinapis arvensis*, *Kochia scoparia*, *Centaurea solstitialis*, and *Galium spurium*) research have shown resistance to be due to a single mutation (single gene) with only one case where resistance was confirmed by two additive genes (*Galeopsis tetrahit*). Alternative theories for the paucity of synthetic auxin resistant weeds are that resistant mutations are extremely rare, or that mutations conferring resistance are lethal.

Transgenic Crops and Synthetic Auxin Resistant Weeds

Synthetic auxin resistant crops (corn, cotton, and soybeans) have been developed to provide an additional herbicide mechanism of action to help manage and mitigate the evolution of herbicide resistant weeds. The synthetic auxin herbicides are inherently low risk herbicides for the selection of herbicide-resistant weeds. However low risk does not mean "No Risk" and as we have seen with glyphosate (another low risk herbicide) if synthetic auxins are used over large areas without sufficient rotation with other herbicide mechanisms of action and use of non-herbicide weed control strategies then they are likely select for resistance relatively rapidly. If used wisely they will provide a way to extend the life of existing herbicides used in these crops.

Synthetic Auxin Herbicides

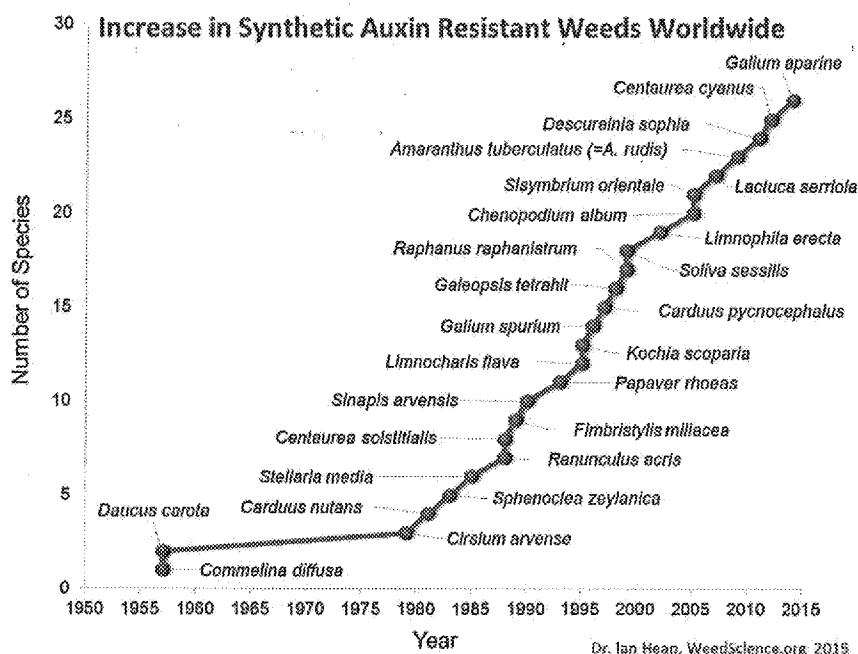
Synthetic auxins were the first highly effective, and selective organic herbicides. They have been used for over 60 years and are still being used extensively worldwide for control of broadleaf weeds in many crops and non-agricultural areas. Synthetic auxins are structurally similar to the natural plant hormone IAA and mimic their effects to kill weeds.

Best Management Practices

Diversity in weed control practices is key to delay and manage herbicide resistance in weeds. This involves:

1. Rotation or mixtures of herbicide mechanisms of action.
2. Using at least two herbicides a year from different herbicide mechanisms of action that are still effective on the particular population of the target weed. This may include use of pre-emergence herbicides.
3. Using cultural/mechanical weed control methods including shallow tillage in the spring, crop rotation, and cleaning equipment.
4. Using full herbicide rates applied at the correct weed size and to carefully monitor results.
5. Scouting fields after herbicide application and controlling escapes.

See Norsworthy et. Al. Reducing the Risks of Herbicide Resistance: Best Management Practices and Recommendations, *Weed Science*, 2012, 60, sp1, 31 for detailed information on resistance management.



REFERENCES

Mithila J., Hall J.C., Johnson W.G., Kelley K.B., and Riechers D.E. 2011. Evolution of Resistance to Auxinic Herbicides: Historical Perspectives, Mechanisms of Resistance, and Implications for Broadleaf Weed Management in Agronomic Crops. *Weed Science* 59:445

Appendix - Example Materials

Other Training

- Examples of Monsanto Internal Training slide decks:
 - **Name:** Maintaining Agricultural Productivity through Diversified Weed Management. **Emphasis:** Weed management approaches to preserve the utility of herbicides including dicamba.
 - **Name:** Weed Resistance Update. **Emphasis:** Example of slide deck used with stakeholders on herbicide resistance development and management.
- Examples of Monsanto newsletter to stakeholders.
 - **Name:** agKnowledge Newsletter. **Emphasis:** Agronomic topics including management of herbicide resistance in crops.

Examples of Monsanto Internal Training slide decks:

Name: Maintaining Agricultural Productivity through Diversified Weed Management.

Emphasis: Weed management approaches to preserve the utility of herbicides including dicamba.

Name: Weed Resistance Update.

Emphasis: Example of slide deck used with stakeholders on herbicide resistance development and management.

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The **value**
of herbicides
to agricultural production systems

What is at stake?

Weed management is a primary operation in ag production because weeds impact farm productivity by reducing yield potential and requiring additional operations.



Reduced crop yield and poor crop quality. The use of herbicides presents growers with an attractive return on investment as well – herbicides in the U.S. are estimated to cost growers approximately \$7 billion annually and return approximately \$26 billion because of higher yield and better quality.²

Herbicides

337M Gallons of fuel saved by U.S. farmers by using herbicides

\$16B Additional profit earned by U.S. farmers from increased yield with herbicide use

\$10B Cost savings in weed control for U.S. farmers thanks to herbicides

1.1B Hours of hand labor saved by using herbicides^a

Value of herbicides goes beyond yields and profitability

The author of this letter is J. S. Gagne, Professor, Loyola University, Chicago, Illinois. He is also a member of the American Psychological Association. The author's address is: J. S. Gagne, Loyola University, Chicago, Illinois 60642.

The **value**
of herbicides
to agricultural production systems

In addition to herbicides, weeds can be managed labor, cultural, and mechanical methods.



HABIT

Hand weeding, while the simplest method of weed control, is backbreaking, time-consuming, increasingly harder to find staff and not practical for large scale farming.



MECHANICS

Mechanical tillage and cultivation are effective, but have environmental costs in terms of soil and nutrient erosion as well as increased greenhouse gases.



COVER CROPS

Cover crops can be an effective means of weed control, but is generally not a stand alone option.



Headline

Chemical herbicides provide a management tool for farmers to control weeds selectively while allowing desired crops to survive and thrive.

Herbicides can be used either as the sole method of control or in combination with non-chemical control methods.



Other practices, such as planting dates and crop rotations can impact weed management but are generally considered secondary to primary methods such as herbicides and mechanical operations.

Our herbicide resources—current situation:

There has not been a novel herbicide product (new model of action) introduced for use in U.S. agricultural systems for over 20 years, and herbicide resistance has continued to grow which has impacted the effectiveness of these existing resources.⁴

The agriculture industry continues to promote stewardship and identify the most effective integrated weed management practices including non-chemical methods to ensure farmers have effective weed management options.

- New modes of action
- Expanded use of existing herbicides
- Biological products
- Development of chemical/ non-chemical integrated options

What is sustainable agriculture?

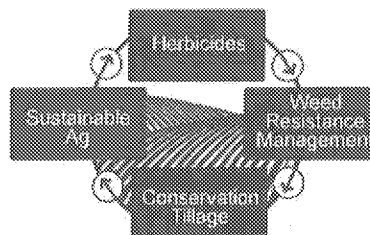
The need to conduct farming operations in a sustainable way is recognized as an important objective by all sectors including government, industry and farm groups. There are many definitions of sustainable ag, but all contain elements that encompass efficient production practices, farm profitability, environmental stewardship and quality of life. Weed management and weed resistance management are important parts of implementing sustainable agricultural operations.

WHAT IS Conservation Tillage?

~~VOLUNTARY DISCLOSURE OF INFORMATION~~

Reduced Tillage*
is defined as any method that retains enough of the previous crop residues such that at least 15% to 30% of the soil surface is covered after planting.*

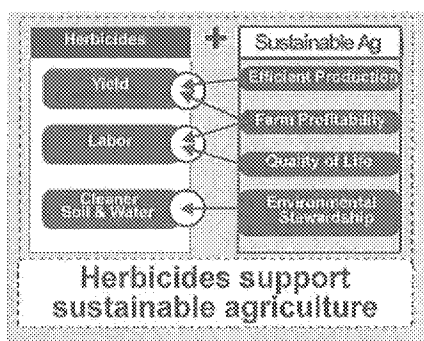
No Till
is defined as any method of growing crops that does not disturb the soil through tillage.



The effectiveness of our herbicide resources is impacted by resistance and this in turn impacts FARMERS ABILITY to conduct farming operations that MEET SUSTAINABLE AGRICULTURE CRITERIA.

[illegible]

What is sustainable agriculture?



Herbicides support sustainable agriculture



According to the USDA's National Resources Inventory data, soil erosion from water and wind on U.S. cropland decreased 43 percent between 1982 and 2003, with much of this decline coming from the adoption of conservation tillage.

A Grower's Choice

REGARDLESS OF WHICH OPTION IS CHOSEN, HERBICIDES ARE AN INTEGRAL PART OF THE SOLUTION

Environmental
Stewardship:

Sustainable ag through herbicides

CONVENTIONAL TILLAGE

CONSERVATION

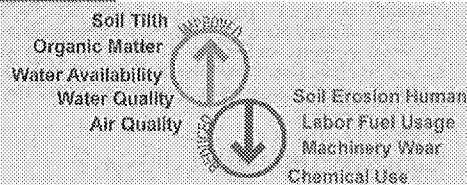
TILLAGE NO-TILL

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1

What is sustainable agriculture?

THE ENVIRONMENTAL BENEFIT OF Conservative Tillage



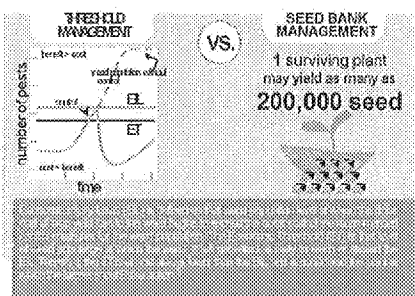
- Improves Soil** A no-till system increases soil particle aggregation (soil soil clumps), making it easier for plants to establish roots.
- Increases Organic** The more soil is tilled, the more carbon is released into the air and the less carbon is available to build organic matter for future crops.
- Improves Water** Leaving crop residue on the surface keeps water in the soil by providing shade (which reduces water evaporation). In addition, residue acts as small natural dams, slowing runoff and increasing the opportunity for water to soak to the soil. Continuous no-till can result in as much as two additional inches of water available to plants in late summer.
- Reduces Soil** Crop residues on the soil surface reduce erosion by water and wind. Depending on the amount of residues present, soil erosion can be reduced by up to 50% compared to an unprotected intensively tilled field.
- Improves Water** Crop residue helps hold soil along with associated waters on the field to reduce runoff into surface water.
- Improves Air** Crop residue left on the surface improves air quality because it reduces wind erosion and the amount of dust in the air, reduces forest fires and smoke from tractors by making fewer turns across the field, and reduces the release of carbon dioxide into the atmosphere by tying up more carbon in organic matter.

Weed Management

Historically, weed management has not always been closely defined in the context of weed resistance management. But, this is changing as the spread of resistant weeds increases and as the evolution and spread of species with multiple herbicide resistance increases in the U.S. There are well-defined options for managing resistance and ultimately, the grower makes the decision on which options to use and when to implement resistance management strategies.

Weed management

has traditionally been built around the concept of weeds reducing crop yield and more recently the concept of seed bank management has been added to reduce the potential for resistance to evolve to our herbicides.



Weed resistance

The progression of weed resistance starts with one resistant plant growing to a population dominated by naturally-occurring biotypes with resistant alleles.

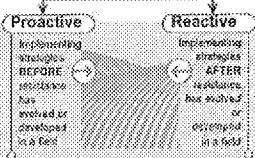


Herbicide resistance is not a new phenomenon and affects most herbicide classes. However, the potential for resistance is not the same for all herbicides.

A weed's potential to evolve resistance to an herbicide is guided by: weed biology, manner in which an herbicide is used (selection pressure), probability for resistant genes within a population, and, in some cases, application rate.

Weed Management

TWO APPROACHES



Approaches to implement proactive strategies are similar to those to implement reactive strategies. However, proactive strategies often require fewer inputs than reactive strategies over the long term and often provide a greater return to the farmer.

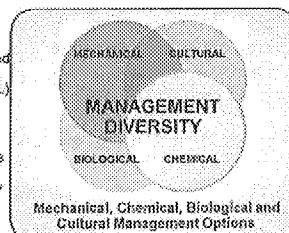
Where herbicides are the primary method of weed management, multiple herbicides with overlapping activity and different modes of action applied in mixtures, sequences and/or in rotation are needed to proactively reduce the potential for resistance.

Existing research indicated that mixtures or sequences applied every year can be more effective than rotating from one herbicide to another across different cropping seasons.

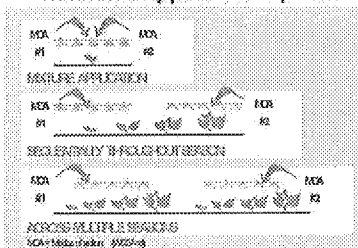
DIVERSIFIED WEED MANAGEMENT (DWM)

The best strategies to manage herbicide resistance in weeds are established on the concept of diversity. Diversity can be achieved by using mechanical, cultural and biological practices in addition to herbicides. (WSSA.net)

The key to managing resistance is to implement a diversified weed management program since selection pressure on any one weed management component is reduced due to overlapping or complementary activity of multiple components.



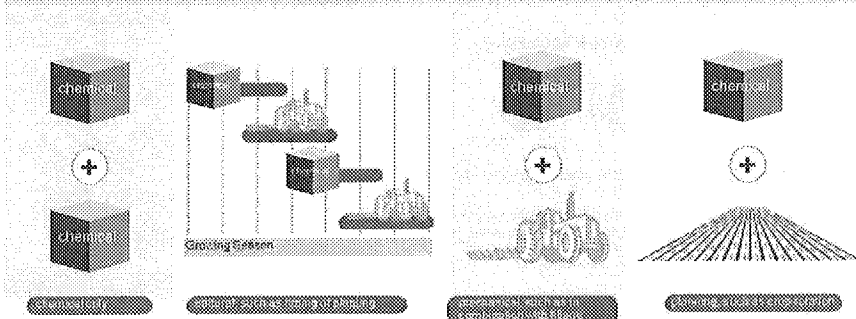
Herbicide Application Options



9

Weed Management

In summary, there is no one best method for resistance management. Having multiple options allows one to fit the best option to a farmer's desired farming operations.



10

Fit and value of glyphosate, dicamba, and glyphosate/dicamba tolerant crops in DWM systems

The key element to implementing a diversified weed management (DWM) program is to have multiple options to use which have overlapping activity on the targeted weeds.

In the absence of new herbicide modes of action, the industry has used other technologies such as biotechnology to expand use of current herbicides by inserting genes that confer tolerance to a herbicide in a crop that would otherwise be killed by the herbicide.

Glyphosate tolerant crops
were one of the first herbicide
tolerant crop biotech offerings.

New traits that confer tolerance to dicamba are in the regulatory approval process.

Benefits of glyphosate tolerant crops (GT)

The primary benefits of GT crops is directly attributable to the benefits of glyphosate, namely:

- Ability to control weeds after they emerge
- Ability to control a broad spectrum of weeds (annuals and perennials, grasses and broadleaves) with a single herbicide
- Increased farmer convenience and simplification of farming operations
- Favorable toxicology and environmental profile

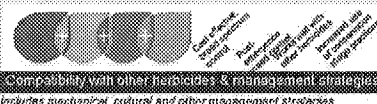
These benefits make glyphosate an excellent product for use in conservation tillage systems and in resistance management programs where glyphosate would complement the activity of other herbicides and non-chemical weed management practices such as use of cover crops.

Value to farmers

Farmers chose glyphosate because of its broad spectrum of control, ability to control weeds after they emerge and favorable health and safety profile.

Additionally, farmers continue to find value in the use of glyphosate even in the presence of glyphosate resistant populations as evidenced by the fact that glyphosate use continues to be high in GT crops.

Glyphosate Qualities



Fit and value of glyphosate, dicamba, and glyphosate/dicamba tolerant crops in DWM systems

Dicamba and Glyphosate Combined Benefits

Team Players



One of the next generation of GT crops developed using biotechnology will be those with tolerance to dicamba.

While dicamba is not a new, it will be a valuable new option in soybeans and cotton to control broadleaf species, such as palmer pigweed and waterhemp, both of which have populations with resistance to multiple soybean and cotton herbicides, including glyphosate.

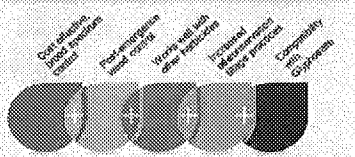
Problem:

Need for new herbicide modes of action in major crops

Solution:

Use of biotech to increase farmer options

Dicamba Qualities



The value of Diversified Weed Management (DWM)





Diversified weed management practices are focused not only on maximizing crop yields, but also on delaying or preventing the evolution and spread of resistant weed populations.

The benefits to implementing DWM programs connect with the basic goals of a sustainable agricultural system.

Managing Weed Resistance

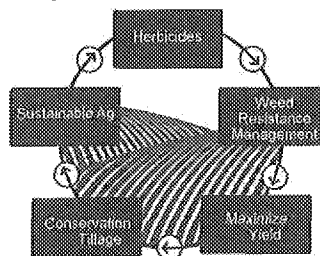
Benefits of diversified weed management:

While implementing best practices for weed resistance management will reduce or prevent the potential evolution of resistance to herbicides, there are other benefits to be derived:

-  **Maximized yield**
DWM practices include the more timely management of weeds, thus maximizing yields
-  **Less intensive labor needs** Proactive implementation of DWM practices will lead to less need for late season hand and mechanical weeding operations
-  **Peace of mind**
Greater assurance of weed control at critical periods of crop growth
-  **Environmental** Better soil health Reduced soil erosion

The success of DWM is contingent on multiple tools being available to provide this diversity. Preserving the effectiveness of existing tools such as glyphosate and technological innovations such as dicamba-tolerant crops will ensure that farmers have the tools needed in order to effectively manage weeds through a DWM approach.





DWM is critical to maintaining the contributions of herbicides to sustainable ag by preserving the availability of herbicide resources.



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The value of Diversified Weed Management (DWM)

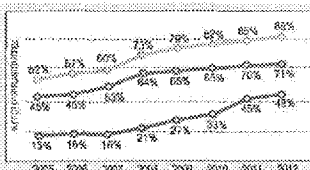
Industry and public sector scientists are working together to address the issue of herbicide resistance on multiple fronts:

1.  **Farmer education and training on best DWM practices**
2.  **Maximizing tillage for early tillage and weed control**
3.  **Conservation tillage and weed control**
4.  **Industry researching and developing new technologies**

GLYPHOSATE RESISTANCE STEWARDSHIP REPORT CARD

Good progress to date and more expected.


- ☐ Farmer education and training on best DWM practices
- ☐ Maximizing tillage for early tillage and weed control
- ☒ Conservation tillage and weed control
- ☒ Industry researching and developing new technologies

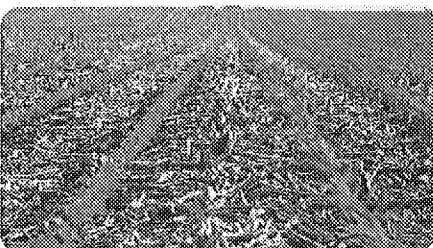



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
Weed Resistance
Update
Illinois



Pending Regulatory Approvals 



<http://www.youtube.com/watch?v=Dj7v9quugsl&list=UUkdU5hnPhz-KH4KGEwiYmBg>

Pending Regulatory Approvals 

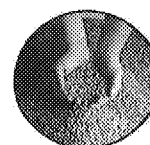
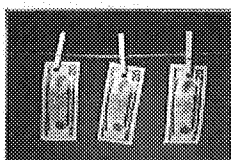
Why Care About Herbicide Resistance?

ROUNDUP READY PLUS
GLYPHOSATE TOLERANT CROPS

Require changes in practices
Increase the cost
Reduce herbicide options
Loss of yield and income



Photo credit (for left): Cotton planted into ultra-narrow rows in rye residue.



Pending Regulatory Approvals

WSSA Herbicide Resistance Management Lesson 1 © 2011 WSSA All Rights Reserved

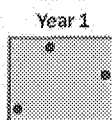
MONSANTO

Potential Yield Impact of the Failure to Manage Herbicide-Resistant Weed Populations

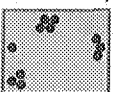
ROUNDUP READY PLUS
GLYPHOSATE TOLERANT CROPS

As a herbicide-resistant weed population increases in density and area, yield potential decreases.

Example



Initial selection



Population increases



20 to 30% infestation



> 50% infestation

Later Years

When herbicide-resistant weed management practices are implemented early, the risks associated with these losses can be reduced.



Negligible impact



5-10% yield loss



20-50% yield loss



50-90% yield loss

Pending Regulatory Approvals

WSSA Herbicide Resistance Management Lesson 1 © 2011 WSSA All Rights Reserved

Common Factors in Resistance Development

ROUNDUP READY PLUS
GLYPHOSATE TOLERANT SOYBEANS

- Limited or no crop rotation
- Limited or no-tillage practices
- A high dependency on a single product and limited use of other herbicides

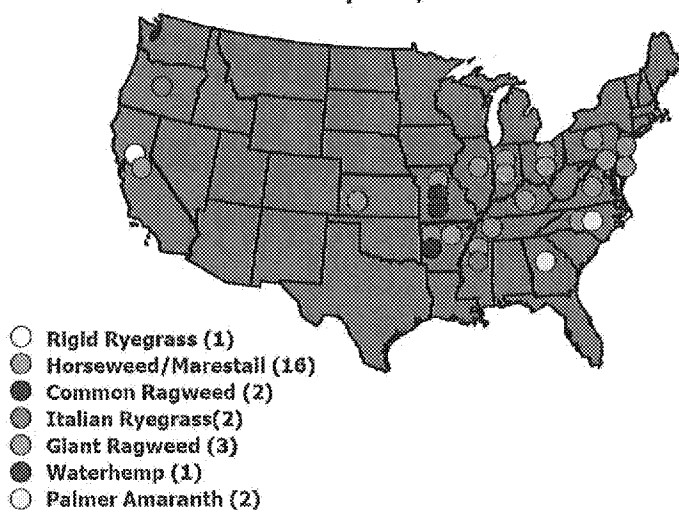


Pending Regulatory Approvals

MONSANTO

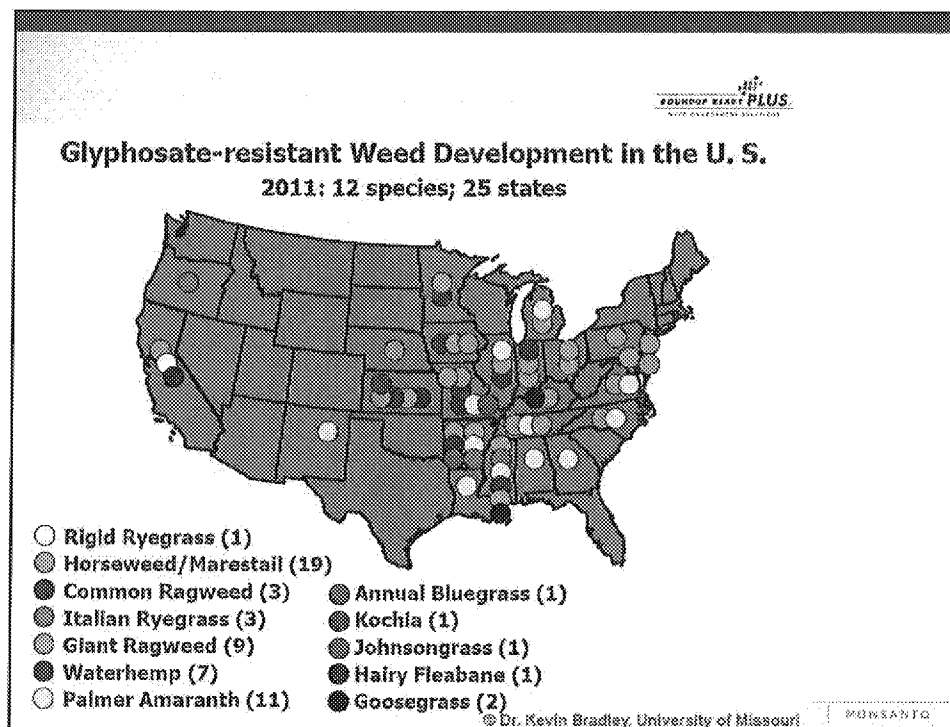
Glyphosate-resistant Weed Development in the U. S.

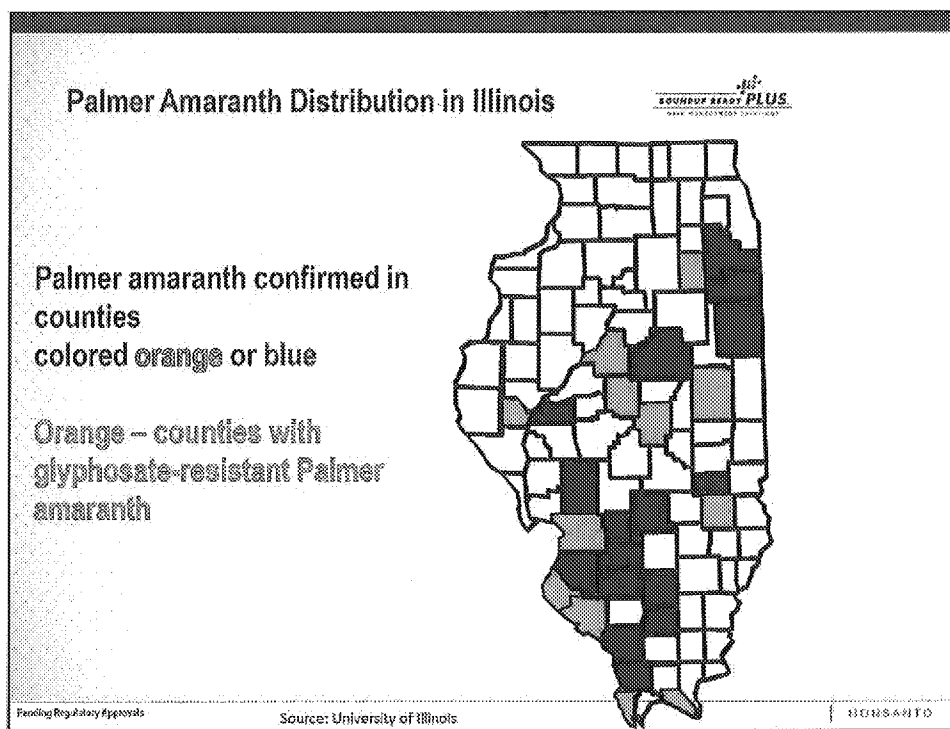
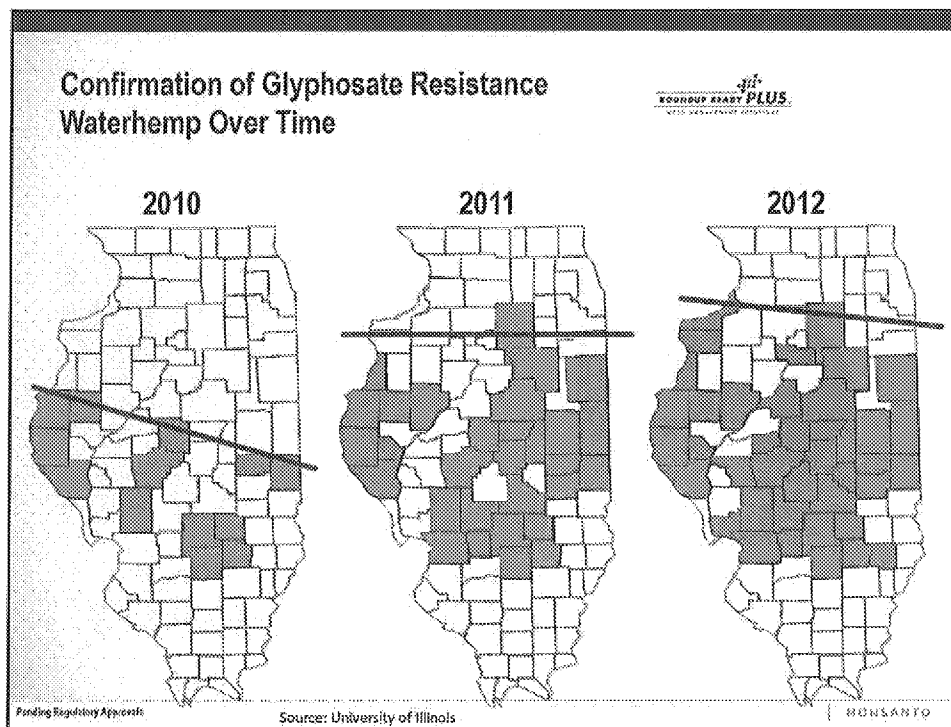
2005: 7 species; 17 states



© Dr. Kevin Bradley, University of Missouri

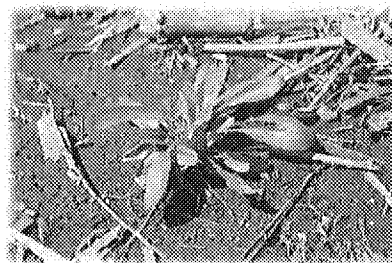
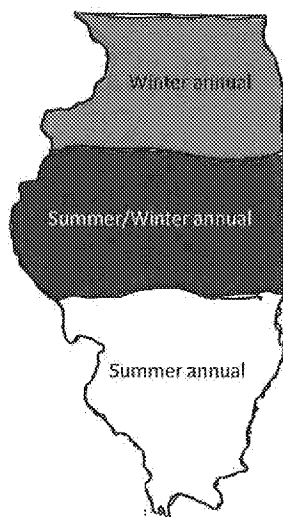
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Marestail: Not All Confirmed Resistance but Very Difficult to Manage Past Rosette Stage

ROUNDUP READY PLUS
GLYPHOSATE ACID



Exhibits differing growth pattern based on geography

Pending Regulatory Approvals

MONSANTO

Keys to Herbicide Resistance Weed Management

ROUNDUP READY PLUS
GLYPHOSATE ACID

- Understand the weed
 - Marestail: control in rosette stage, 2,4-d in burndown
 - Waterhemp: long emergence pattern, overlap residuals
- Use multiple modes of action
- Don't let troublesome weeds emerge
- Make your herbicide applications count
 - Use best practices (i.e. right rate, right time, right conditions)
- Consider all management options
 - Tillage, row spacing, fall applications, etc

Pending Regulatory Approvals

MONSANTO

**Broad Recommendations need to start simple,
as 1, 2, 3...Burndown / PRE / Tank-mix RUP**

Roundup Ready PLUS
GLYPHOSATE RESISTANT SEEDS

1) Start Clean – Tillage / Burndown

- Tank mix with Roundup® agricultural herbicides as needed
- Use a residual as needed

2. Apply a PRE Emergence Residual Herbicide

- Warrant® Herbicide/ Valor® Brands / Authority® Brands
- Select Based on Technical Fit

3. Apply a Post Emergence Residual Herbicide

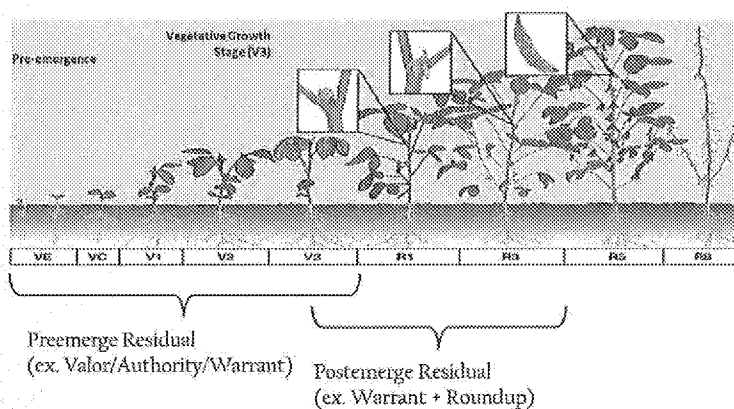
- Warrant® Herbicide or Tank-mix RUP (Roundup® agricultural herbicides) Opportunity
- Warrant® Herbicide + Cobra® or Flexstar® if glyphosate resistant weeds have emerged (less than 4")

Pending Regulatory Approvals

MONSANTO

Overlapping Residuals

Roundup Ready PLUS
GLYPHOSATE RESISTANT SEEDS



Pending Regulatory Approvals

MONSANTO

Herbicide-Resistant Traits in Crops

Roundup Ready
PLUS
With Glyphosate

The way forward is to **diversify**

- Crop rotation and herbicide diversity are cornerstones for going forward
- No new herbicide mode of action (MOA) has been found in 20 years
- More MOA will be used today and in future

Pending Regulatory Approvals

MONSANTO

Examples of Monsanto newsletter to stakeholders.

Name: agKnowledge Newsletter.

Emphasis: Agronomic topics including management of herbicide resistance in crops.



ISSUE 1409 MIDSOUTH

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- Roundup Ready® Xtend Crop System | 2
- Soil Sampling Reminders | 3

AsgrowandDEKALB.com
Deltapine.com

Please contact your local agronomist
for more information



agKnowledge Newsletter

The lay of the land from a trusted source.

Current News and Updates

Wow—what a crop this has turned out to be! Late September finds us well underway with corn and soybean harvest in the Delta. Since we were blessed with such a temperate summer, we have some very good yields being reported up and down the Mississippi river for both corn and soybean acres, and many areas will set county yield records for both crops, especially in dryland areas.

Cotton defoliation is underway in most areas and we're already picking in the South Delta. Yields will show some variability up and down the river this year, as some areas had a little too much water. Still, some areas have a very good boll load and we will see some two and three bale yields out there.

One issue we have seen showing up at the end of this season is nutrient deficiency appearing as crops are making that last nutrient pull to fill grain and complete the cycle. Potash deficiency in cotton and soybean acres has been the most prevalent symptom and is a good reminder for us to put back what we have removed during this season. These record grain yields are removing a lot of nutrients that must be replaced in order to keep yield potential from plateauing or dropping in 2015. If at all possible, put together a fall fertility plan and use those extra pounds of lint and bushels of grain to reinvest in your land. Allowing nutrient levels to drop will cost you, either in yield potential or the cost of applying the nutrients. Nutrient management tends to be a pay me now or pay me later scenario, so make that investment this fall if possible.

As always, be safe out there as we proceed through the remainder of the harvest season!

Larry Ganann
Territory Agronomist, Tennessee

Building a Herbicide-Resistant Weed Management Strategy in Soybean

A comprehensive soybean weed management program should include a preplant, burndown, pre-emergence, in-crop, and possibly post-harvest herbicide applications to help manage weed competition and stop the spread of tough-to-control weed species.

Multiple Modes of Action. The addition of herbicides with different modes of action into a weed management program can help to manage herbicide-resistant weed species and also decrease the risk of developing weed resistance.

Residual Herbicides. The use of residual herbicides in a soybean weed management program may increase yield potential by reducing weed pressure and lengthen the amount of time for postemergence herbicide applications.

Timely Weed Removal. Always control weeds when they are small to help increase herbicide efficacy and to protect soybean yield potential. For every inch of weed height greater than 4 inches, a 2 to 3% yield loss has been observed.¹ Weeds can often grow 1 inch in 3 to 4 days.

Germplasm. Soybean product selection is a critical component of a weed management strategy. Products should be chosen based on yield potential, disease tolerances, and other characteristics, not solely on their tolerance to specific herbicides.

(cont. on p 2)



Figure 1. Glyphosate-resistant Palmer amaranth.

Building a Herbicide-Resistant Weed Management Strategy in Soybean (cont. from p 1)

Use full labeled rates. Always follow and apply labeled rates. For glyphosate applications, apply based on the rate necessary for the most difficult-to-control weed in the field. Application of lower than labeled rates can allow for weed escapes and potentially select for weeds with herbicide tolerance.

Management Options

Several tactics are needed to effectively manage herbicide-resistant weed populations. These are aggressive weed species that require aggressive management tactics.

Herbicide programs should include soil residual herbicides applied at full recommended rates, using multiple modes of action, and multiple/overlapping treatments when necessary.

- Tillage can help bury small seeds that require sunlight to germinate; however, subsequent tillage may stimulate germination by bringing seeds back to the surface.¹

Table 1. Soybean herbicide recommendations.

Application timing	Tank mix options with Roundup PowerMAX® or Roundup WeatherMAX®
Burndown (February)	Dicamba + AMS (17lbs/100 gal)
Preplant/ PRE	Valor®, or Authority® MTZ + Gramoxone® SL Brands + Warrant® Herbicide
POST (over-the-top)	Warrant Herbicide + Flexstar® Herbicide
Recommendation & Incentives: Crop PhD tool. Roundup Ready PLUS® Crop Management Solutions.	

- Hand weeding prior to seed set or complete removal of the herbicide-resistant weeds from a field may be necessary if the weed has set seed.

Genuity® Roundup Ready 2 Yield® Soybeans. Roundup® brand agricultural herbicides, with the active ingredient glyphosate, are the key herbicides used with Genuity Roundup Ready 2 Yield soybean. Along with

glyphosate, residual herbicides are recommended for application, especially if glyphosate-resistant weeds are suspected (Table 1).² Contact herbicides, such as Flexstar®, are also recommended to control emerged glyphosate-resistant weeds in season or postemergence.

Sources:

¹ Kamienski, C. 2003. Effect of postemergence glyphosate application timing on weed control and grain yield in glyphosate-resistant soybean. University of Illinois.

² Recommendation & Incentives: Crop PhD tool. Roundup Ready PLUS Crop Management Solutions. <https://www.roundupreadyplus.com> (verified 9/9/2014). 140926072329

Roundup Ready® Xtend Crop System

Pending regulatory approvals, the Roundup Ready® Xtend Crop System is designed to help maximize weed control in cotton and soybeans through providing more consistent, flexible control of weeds, especially tough-to-manage and glyphosate-resistant weeds. During the 2014 growing season, trials and training locations were held across the country, including the Midsouth.

Once regulatory approvals are obtained, this innovative crop system for soybeans and cotton will consist of:

- Innovative seed products to be branded as Bollgard II® XtendFlex™ cotton, and Roundup Ready 2 Xtend™ soybeans.
- An enhanced, low-volatility dicamba and glyphosate herbicide to be branded as Roundup Xtend™ herbicide and a straight goods dicamba formulation to be branded as XtendiMax™ herbicide.

Upon registration, Monsanto's dicamba formulations, built with VaporGrip™ Technology, will be labeled for use before, at, and after planting crops within the Roundup Ready Xtend Crops System. By using low volatility formulations, in combination with application requirements, growers can significantly reduce the potential for off-target movement, compared to commercially available products containing DMA dicamba.

Bollgard II XtendFlex cotton will have the first stack of herbicide tolerant technologies in cotton containing Genuity®

Roundup Ready® Flex stacked with glyphosate-, dicamba-, and glufosinate-tolerance. It will include three different modes of herbicide action for the most effective weed management system available. Pending regulatory approvals, Bollgard II XtendFlex cotton will help to deliver trusted insect protection in addition to effective weed control.

Roundup Ready 2 Xtend soybeans will have tolerance to both glyphosate and dicamba herbicides by combining, upon regulatory approvals, the dicamba-tolerance trait with Genuity® Roundup Ready 2 Yield® technology.

Monsanto has developed a full set of application requirements to educate users on the proper stewardship practices and correct use of the technology. The Roundup Ready Xtend Crop System is developed around application methods proven to increase on-target application.

Growers interested in the new technology can get the latest information, including stewardship practices, dicamba history and benefits, and system recommendations at:

<http://www.RoundupReadyPLUS.com>

This information is for educational purposes only and is not an offer to sell Roundup Ready 2 Xtend, Bollgard II XtendFlex, Roundup Xtend, or XtendiMax herbicides. These products are not yet registered or approved for sale or use anywhere in the United States.

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Soil Sampling Reminders

The most practical time for soil sampling is after harvest and prior to fall or spring fertilization. Soil samples should be taken: at least every four years, at the same time of year, and following the same crop.^{1,2} The number of samples to collect and the precision of the test results depends on what sampling pattern is used. The quality of the sampling methods greatly influences the accuracy of soil test results and the opportunity to make more accurate soil management decisions.

Best Timing

The optimum time to test soil is when growing crops have their greatest uptake of nutrients to support plant growth. Since sampling in the summer is often not practical, the timeframes after harvest and prior to fall or spring fertilization offer an alternative timing. It is not recommended to sample in the winter or too early in the spring since results may be misleading due to physical and chemical changes in the soil from cold temperatures. Due to time constraints, spring sampling may not allow enough time to develop an appropriate nutrient strategy prior to planting, with the exception of testing for nitrogen.

Samples: How Often and How Many

It is recommended to test soils at least every four years. Nutrient availability is highly influenced by soil and/or environmental conditions, and the seasonal variation should be accounted for when collecting soil samples; especially when comparing soil test results across years. Due to the dynamic nature of nutrient variability, sampling should occur at the same time of year and following the same crop. Each field or practical management area should be sampled separately. The recommended number of soil samples is a balance between what is acceptable by the grower from both a cost and precision standpoint. However, the number of samples collected should be sufficient to capture variability within the field.

Recommendations vary for the number of cores taken at each sampling point with the goal being to collect a representative sample at each point. Recommended core samples range from 5 to 7 cores at each point up to 15 to 20 cores.³ If an area is known for highly variable soil, then more cores should be taken at each point. Tillage also influences the number of cores required to obtain a representative sample. Due to less mixing and more spatial variation, continual no-till or fields that do not receive tillage on a regular basis will require more cores for each sample (8 to 12) than a field that receives tillage regularly.² Sampling depth should be taken according to the fertilizer recommendations.

Patterns for Sampling

The sampling pattern impacts the number of samples that will be taken in a field and the precision of soil test results.

Whole Field. If a grower chooses to manage the field as a

single unit, then a single, representative soil sample should be pulled and analyzed from the field. This method may be the least expensive from a soil sampling standpoint; however, it may not be cheaper from a fertilizer cost perspective.

For collection of a representative sample, collect and composite between 10 and 20 cores for the field. A pattern which accommodates good representation of the area sampled such as a "Z" or "W" pattern is recommended. Sampling should avoid areas that are likely to skew results, such as fertilizer bands, headlands, dead furrows, areas of dust patterns along limestone roads, and areas where stockpiling of composts, manure, or lime have been placed.^{1,3} Collecting the soil cores in a clean, plastic bucket is recommended. Mix the cores thoroughly before filling the sample bag 1/2 to 2/3 full.

Grid Sampling. Grid sampling divides a field into individual squares or rectangles of equal size, often referred to as "grid cells". Common grid cell sizes include 2.5-acre, 4-acre, and 8-acre grids. GPS is frequently used to identify precise soil sampling locations.² Five to seven cores from each grid cell should be collected and composited. Cores may be taken at the center of the grid cell and within 30 feet in each direction from the center of the grid cell. Alternatively, a random collection of cores throughout the grid cell can be taken.

Site specific sampling by GPS coordinates is intended to help determine changes over time by returning to the exact same location for sampling. Site specific sampling may also be used to sample at different locations so that a more complete picture of nutrient resources over time is created.

Management Zone Sampling. A management zone is an area that is managed in a similar fashion and differs from other management zones within a field.³ Management zones within a field can be identified by a single or multiple spatial characteristics (Figure 2). Common characteristics include soil type, soil slope, organic matter, yield (production), and soil electrical conductivity. Soil samples are collected at random from within each zone, bulked together, and analyzed to provide an average sample value for each unit.

Handling

Samples can either be sent immediately to a testing facility or left to dry in a dust-free location. Make sure to thoroughly complete the soil information sheet provided by the lab. Information such as cropping history, soil region, and yield goal will be used to calculate recommendations based on the soil

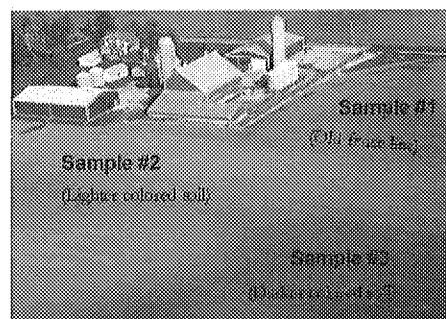


Figure 2. Sampling areas based on variation across the field as indicated by differences in soil type and an old fence line.

(cont. on p 4)



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Soil Sampling Reminders (cont. from p 3)

sample. Samples can be sent to university testing facilities or to private labs. Avoid sending samples over a weekend.

Interpreting Soil Test Results

Once you have an accurate and comprehensive field assessment from soil sampling, soil testing can be repeated at the same locations to track fertility and pH changes over time. Or, subsequent sampling can be redefined in order to analyze only representative areas of each field. Another option may be to reduce future sampling to only problem areas.

By examining the pattern of variability a grower can learn more about his field. The patterns of high and low soil property values may be tied to soil type or slope, or they may help explain yield variability. Interpreting the variability in soil

test values can take a bit of detective work; it may require looking at past farm records or recalling farming in the past.

In summary, the quality of the sampling methods greatly influences the accuracy of soil test results. An investment in soil testing is an opportunity to make more accurate soil management decisions.

Sources:

- ¹ Mallarino, A. and J. Sawyer. Nutrient management: Soil testing. Iowa State University Extension. NMEP 1. Revised September 2003. <http://extension.agron.iastate.edu> (verified 8/30/14).
- ² Hoefft, R. and T. Peck. University of Illinois Agronomy Handbook. Chapter 11: Soil Testing and Fertility. <http://extension.cropsci.illinois.edu> (verified 8/30/14).
- ³ Sawyer, J. et al. Take a good soil sample to help make good decisions. Iowa State University Extension. PM 287. Revised September 2003. (verified 8/30/14). 140926074047

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Appendix - Example Materials
Technology Use Guide Pertinent Pages

- Pertinent pages to Xtendimax from the Technology Use Guide. Emphasis is on weed management including the practices to delay the selection for and manage existing populations of herbicide resistant weeds.



U.S. TECHNOLOGY USE GUIDE
and INSECT RESISTANCE MANAGEMENT OVERVIEW

2017 TUG

MONSANTO



Weed Management

Monsanto believes product stewardship is a fundamental component of customer service and responsible business practices. Monsanto is committed to the proper use and long-term effectiveness of its proprietary herbicide brands through a four-part stewardship program: developing appropriate weed control recommendations, continuing research to refine and update recommendations, education on the importance of effective weed management and responding to repeated weed control inquiries through a product performance evaluation process.

As leaders in the development and stewardship of Roundup® agricultural herbicides, the Roundup Ready® Xtend Crop System and other products, Monsanto invests significantly in research conducted in conjunction with academic scientists, extension specialists and crop consultants, that includes an evaluation of the factors that can contribute to the development of herbicide resistance and how to properly manage weeds to delay the selection for herbicide resistance. Visit RoundupReadyPLUS.com for practical, best practices-based information on reducing the risk for development of dicamba- or glyphosate-resistant weeds and for managing the risk on a field-by-field basis. In addition, visit the Weed Science Society of America at wssa.net to access herbicide resistance training lessons that provide in-depth educational information.

Group Number

Glyphosate, the active ingredient in products such as Roundup WeatherMAX®, Roundup PowerMAX® and Roundup PowerMAX® II, is a Group 9 herbicide based on the mechanism of action classification system of the Weed Science Society of America. Using the same system, glufosinate, the active ingredient in Liberty® brand herbicides, is a Group 10 herbicide, and dicamba, the active ingredient in XtendiMax™ with VaporGrip™ Technology, is a Group 4 herbicide. Any weed population may contain plants naturally resistant to any herbicide group. Such resistant weed plants may not be effectively managed when using an herbicide that the weed plant is resistant to, but may be effectively managed utilizing another herbicide alone or in mixtures from different herbicide groups and/or by using cultural or mechanical practices. Consult your local brand representative, state cooperative extension service, professional consultants or other qualified authorities to determine appropriate actions for treating specific resistant weeds.

Weed Management Recommendations

Proactively implementing diversified weed control strategies to help minimize selection for weed populations resistant to one or more herbicides is recommended. A diversified weed management program may include the use of multiple herbicides with different mechanisms of action and overlapping weed spectrum with or without tillage operations and/or other cultural practices. Research has demonstrated that using the labeled rate and following label use directions is important to delay the selection for resistance. Scouting after a herbicide application is important because it can facilitate the early identification of weed shifts and/or possible herbicide-resistant weeds

and thus provide direction on future weed management practices. One of the best ways to manage resistant populations is to implement measures to avoid allowing weeds to reproduce by seed or to proliferate vegetatively. Cleaning equipment between sites and avoiding movement of plant material between sites will greatly aid in retarding the spread of resistant weed seed.

In the Roundup Ready® System and Roundup Ready® Xtend Crop System it is important to start with a clean field, using either a burndown herbicide application or tillage, and to optimize herbicide performance by controlling weeds early when they are small and actively growing.

In summary,

- Start with a clean field, free of weeds.
- Use a diverse set of weed control tools, including residual herbicides that use a different mechanism of action.
- Add other herbicide products, at the right rate and timing for postemergence weed control as allowed by the product label.
- Control weed escapes and remove weeds before they set seed.

The Roundup Ready PLUS® Crop Management Solutions by Monsanto is based upon the principle of growers implementing diversified weed management programs in Roundup Ready and Roundup Ready Xtend Crop Systems as described above. It is composed of recommendations and incentive programs. Roundup Ready PLUS represents Monsanto's commitment to providing solutions to farmers to help avoid and/or manage herbicide resistance to glyphosate and other herbicides in the Roundup Ready and Roundup Ready Xtend Crop System. For more information visit RoundupReadyPLUS.com.

Monsanto supports the **Take Action** partnership. Take Action is an industry-wide partnership between university weed scientists, major herbicide providers and organizations representing corn, cotton, sorghum, soybean and wheat growers to help them manage herbicide-resistant weeds. The Take Action effort encourages the development of a proactive strategy to manage herbicide-resistant weeds that incorporates a diverse set of controls. To find out more, visit TakeActionOnWeeds.com, or contact your local extension office.



Dicamba- or Glyphosate-Resistant Weeds

Monsanto investigates and studies new claims of potential dicamba- or glyphosate-resistant weeds. Report any incidence of repeated non-performance of Monsanto branded glyphosate or dicamba products on a particular weed to the appropriate company representative, local retailer or county extension agent. When dicamba- or glyphosate-resistant weed biotypes are confirmed, Monsanto provides recommended control measures, which may include additional herbicides, tank-mixes (when not restricted on the label) or cultural practices. Monsanto actively communicates all of this information to growers through

Read and follow all product labeling before making in-crop or other applications of Monsanto branded glyphosate herbicides, Monsanto branded dicamba herbicides or using any other pesticide. For supplemental labels or fact sheets for Monsanto products, call 1-800-768-6387. Monsanto does not restrict your ability to use any herbicide so long as the product is specifically registered and labeled for in-crop use on the applicable crop. Read the product label or contact the product manufacturer if you have questions about EPA or state approvals for in-crop use. MONSANTO DOES NOT MAKE ANY REPRESENTATIONS, WARRANTIES OR RECOMMENDATIONS CONCERNING THE USE OF PRODUCTS MANUFACTURED OR MARKETING BY OTHER COMPANIES INCLUDING BUT NOT LIMITED TO THOSE THAT ARE LABELED FOR USE ON CROPS CONTAINING MONSANTO TECHNOLOGIES. MONSANTO SPECIFICALLY DISCLAIMS ALL RESPONSIBILITY FOR THE USE OF THESE PRODUCTS IN CROPS CONTAINING ROUNDUP READY TECHNOLOGIES. ALL QUESTIONS AND COMPLAINTS ARISING FROM THE USE OF PRODUCTS MANUFACTURED OR MARKETING BY OTHER COMPANIES OR THE PERFORMANCE OF MONSANTO TECHNOLOGY IN CONNECTION WITH THE USE OF SUCH PRODUCTS, SHOULD BE DIRECTED TO THOSE COMPANIES.

multiple channels, including the herbicide label, weedsience.org, supplemental labeling, this TUG, media and written communications, Monsanto's website RoundupReadyPLUS.com, and grower meetings. Monsanto will report annually any inability to control likely dicamba resistant weeds at www.HerbicideResistanceInformation.com.

Growers must be aware of, and proactively manage for, dicamba- or glyphosate-resistant weeds in planning their weed control program. If a weed is known to be resistant to dicamba or glyphosate, then a resistant population of that weed is by definition no longer controlled with labeled rates of dicamba or glyphosate herbicides. Roundup WeatherMAX®, Roundup PowerMAX® and Roundup PowerMAX® II are not warranted to cover the failure to control glyphosate-resistant weed populations; Xtendimax with VaporGrip Technology is not warranted to cover the failure to control dicamba-resistant weed populations.

Recommendations for Managing Resistant Weeds in Roundup Ready® and Roundup Ready® Xtend Crop Systems

Various weed biotypes are known to be resistant to glyphosate and dicamba. For the current weed control recommendations for dicamba- or glyphosate-resistant weed biotypes, refer to RoundupReadyPLUS.com. A complete list of specimen labels can be located at www.monsanto.com/products/Pages/msds-labels.aspx. Approved labels, including supplemental labeling, must be in the possession of the user at the time of pesticide application and can be obtained by calling 1-800-768-6387 or by contacting your State Pesticide Lead Agency for more information.

Glyphosate Endangered Species Initiative Requirement

Before making an application of any glyphosate-based herbicide product, licensed growers of crops containing Roundup Ready technology must access the website pre-serve.org to determine whether any mitigation requirements apply to the planned application to those crops, and must follow all applicable requirements. The mitigation measures described on the website are appropriate for all applications of any glyphosate-based herbicide to all crop lands.

Growers making only ground applications to crop land with a use rate of less than 3.5 lbs. of glyphosate a.e./A are not required to access the website. If a grower does not have web access, the seed dealer can access the website on behalf of the grower to determine the applicable requirements, or the grower can call 1-800-332-3111 for assistance.

Tank-mixing with Roundup WeatherMAX®, Roundup PowerMAX® and Roundup PowerMAX® II Herbicides

Roundup WeatherMAX, Roundup PowerMAX and Roundup PowerMAX II are products sold for in-crop use with the Roundup Ready System in 2017.



Roundup WeatherMAX®



Roundup PowerMAX®



Roundup PowerMAX® II

Tank-mixtures of Roundup WeatherMAX, Roundup PowerMAX and Roundup PowerMAX II with insecticides, fungicides, micronutrients or foliar fertilizers are not recommended as they may result in reduced weed control, crop injury, reduced pest control or antagonism. Refer to the product label, supplemental labeling or fact sheets published separately by Monsanto for the Roundup agricultural herbicides tank-mix recommendations.



Bollgard® 3 XtendFlex® Cotton Bollgard II® XtendFlex® Cotton XtendFlex® Cotton

Growers should follow recommended weed management guidelines when managing Bollgard® 3 XtendFlex®, Bollgard II® XtendFlex® and XtendFlex® cotton. Growers of Bollgard 3 XtendFlex® and Bollgard II XtendFlex cotton must follow the required refuge options, practicing IRM and managing target and non-target pests as described in the Bollgard 3 XtendFlex and Bollgard II IRM Grower Guide.

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Monsanto products are commercialized in accordance with ETS Product Launch Stewardship Guidance, and in compliance with Monsanto's Policy for Commercialization of Biotechnology-Derived Plant Products in Commodity Crops. As of November 1, 2016, this product has been approved for import in Australia, Mexico, Japan and Canada. Any crop or material produced from this product can only be exported to, or used, processed or sold in countries where all necessary regulatory approvals have been granted. It is a violation of national and international law to move material containing biotech traits across boundaries into nations where import is not permitted. Growers should talk to their grain handler or product purchaser to confirm their buying position for this product. Growers should refer to biotraderstatus.com for any updated information on import country approvals.

Weed Management

Weed control in cotton is essential to help maximize both fiber yield and quality potential. Cotton is very sensitive to early season weed competition, which can result in unacceptable stands and/or reduced yield potential. Bollgard 3 XtendFlex, Bollgard II XtendFlex and XtendFlex cotton will provide additional weed control options for use before, at and after planting.

Select timing of application based on the most difficult-to-control weed species in your field.

Post-direct or hooded sprayers can be used to achieve more thorough spray coverage on weeds, and can allow the use of other approved herbicides to control tough weeds.

Residual herbicide(s) may be applied as either a preemergence (including preplant incorporated), postemergence, and/or layby application as allowed on the label of the specific product being used. Weeds growing at the time of the residual herbicide application will need to be controlled using a post-emergence herbicide.

Various weed biotypes are known to be resistant to glyphosate. For the current weed control recommendations for glyphosate-resistant weed biotypes, refer to RoundupReadyPLUS.com or call 1-800-768-6387. A complete list of specimen labels can be located at www.monsanto.com/products/Pages/msds-labels.aspx. Approved labels, including supplemental labeling, for Roundup® agricultural herbicides must be in the possession of the user at the time of pesticide application and can be obtained by calling 1-800-768-6387 or by contacting your State Pesticide Lead Agency for more information.

Recommendations

Follow all pesticide product labeling. If there is any conflict between these recommendations and the applicable pesticide product labeling, the pesticide product labeling controls. Follow the recommendations below to

help minimize the risk of developing herbicide resistance in Bollgard 3 XtendFlex, Bollgard II XtendFlex and XtendFlex cotton:

- Scout fields before and after each burndown and in-crop application.
- Start with a clean field, using either a burndown herbicide application, residual herbicide or tillage, making sure weeds are controlled at planting.
- Add soil residual herbicide(s) and cultural practices as part of a Bollgard 3 XtendFlex, Bollgard II XtendFlex and XtendFlex cotton weed control program.
 - Soil residual herbicides are critical to control emerging glyphosate-resistant weeds, such as Palmer amaranth.
 - Residual herbicides should be used multiple times during the growing season if glyphosate-resistant weeds are expected.
- In-crop, apply Roundup WeatherMAX® herbicide at a minimum of 22 oz/A when weeds are less than 3" in height and tank-mix with another approved herbicide, if necessary.
- When glyphosate-resistant weeds are present and emerged, an application of XtendiMax Herbicide with VaporGrip Technology at 22 oz/A should be applied to weeds 4 inches or less. Liberty herbicide may also be used at 29 to 44 oz/A when weeds are 3 inches or less. (Please refer to Liberty Label).
- Late-season control of emerged weeds with a diversity of control tools will reduce the potential of adding more seeds to the seedbank.
- Equipment should be cleaned before moving from field to field to minimize the spread of weed seed (as well as nematodes, insects and other cotton pests).
- It is not recommended that XtendiMax with VaporGrip Technology be applied more than twice in a season.
- Report any incidence of repeated non-performance of Roundup agricultural herbicides or other glyphosate or glufosinate products on a particular weed to the appropriate company representative, local retailer, or county extension agent.

Bollgard® 3 XtendFlex® Cotton, Bollgard II® XtendFlex® Cotton, XtendFlex® Cotton

Herbicide Applications for Bollgard® 3 XtendFlex®, Bollgard II® XtendFlex® and XtendFlex® Cotton

Roundup WeatherMAX®, Roundup PowerMAX® and Roundup PowerMAX® II Herbicides

- May be applied in-crop, from crop emergence up to 7 days prior to harvest.
- A maximum rate of 32 oz/A per application may be applied using ground application equipment while the maximum is 22 oz/A per application by air.
- There are no growth or timing restrictions for sequential applications.
- Four (4) quarts/A (128 oz/A) is the total in-crop volume allowed from emergence to 60% open bolls.
- A maximum total volume of 44 oz/A may be applied between layby and 60% open bolls.
- Post-directed application of Roundup WeatherMAX, Roundup PowerMAX or Roundup PowerMAX II, either alone or in a tank-mix with another herbicide labeled for post-directed application in cotton, may be used to achieve more thorough spray coverage of weeds.

Preharvest Application

- Up to 44 oz/A may be applied after cotton reaches 60% open bolls and before harvest, if needed.
- Application must be made at least 7 days prior to harvest.
- The maximum volume of Roundup WeatherMAX, Roundup PowerMAX or Roundup PowerMAX II that may be used in a single season is 5.3 quarts/A (169.6 oz/A).

Liberty® Herbicide

- Apply from emergence to early bloom growth stage.
- Sequential applications should be applied at least 10 days after the first application.
- Up to 87 oz/A of Liberty® can be applied on cotton per growing season or up to 72 oz/A if more than 29 oz/A was used in a single application. See Liberty label for guidelines on maximum seasonal use rates.
- A tank-mix of Liberty and a Roundup® agricultural herbicide may result in reduced grass control.
- Do not apply within 70 days of harvest.
- Consult product label for full use directions and restrictions.

XtendiMax™ Herbicide with VaporGrip™ Technology

XtendiMax with VaporGrip Technology may only be tank-mixed with products that have been tested and found not to adversely affect the offsite movement potential of XtendiMax with VaporGrip Technology. A list of those products may be found at www.xtendimaxapplicationrequirements.com.

- May be applied in-crop, from crop emergence up to 7 days prior to harvest.

- Up to 1.0 lb/A of dicamba (44 oz/A of XtendiMax with VaporGrip Technology) may be used preemergence.
- 0.5 lb/A of dicamba (22 oz/A XtendiMax with VaporGrip Technology) may be applied twice postemergence.
- Products must be applied in a minimum of 10 GPA carrier volume.
- Sequential applications postemergence may be made at least 7 days apart.
- No more than 2.0 lb/A of dicamba may be used, total, per growing season.
- For best results, dicamba based weed management programs must include the use of residual herbicides preemergence as well as at least one postemergence application.
- Report any incidence of non-performance of XtendiMax with VaporGrip Technology against a particular weed species to your Monsanto retailer, representative or call 1-844-RRXTEND.

Crop Safety of In-Crop Glyphosate Applications

Monsanto has determined that a combination of components in glyphosate formulations have the potential to cause leaf injury when applied during later stages of crop growth. Roundup WeatherMAX, Roundup PowerMAX and Roundup PowerMAX II are the only Roundup agricultural herbicides labeled and approved for use in Bollgard 3 XtendFlex, Bollgard II XtendFlex and XtendFlex cotton.

Leaf injury may occur if the products are not used according to the product label, used at rates higher than directed or if overlap of spray occurs in the field. Growers must confirm that any glyphosate formulation to be used on Bollgard 3 XtendFlex, Bollgard II XtendFlex and XtendFlex cotton is labeled for use on Bollgard 3 XtendFlex, Bollgard II XtendFlex and XtendFlex cotton and has been tested to demonstrate crop safety.

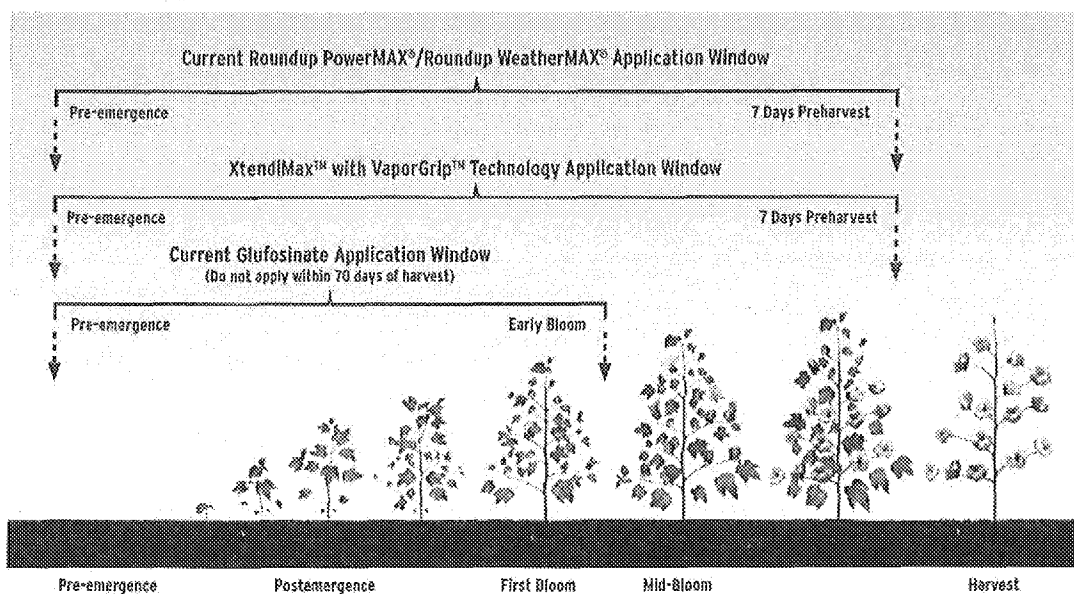
Potential for Crop Response with In-Crop Dicamba Applications

Postemergence applications of dicamba may cause a leaf response to Bollgard 3 XtendFlex, Bollgard II XtendFlex and XtendFlex cotton. The symptoms usually appear as necrotic spots on fully expanded leaves. Incidence of response can increase when dicamba is tank-mixed with other herbicides or insecticides. To reduce the incidence and severity of necrosis, consider increasing the spray volume to 15 GPA or greater and lower adjuvant rates. Emulsifiable Concentrate (EC) based products that are tank mixed with products containing dicamba may increase the severity of the leaf damage.

Complete label information for these and all recommended products can be found at cdms.net.

Bollgard® 3 XtendFlex® Cotton, Bollgard II® XtendFlex® Cotton, XtendFlex® Cotton

Herbicide Application Windows





Roundup Ready 2 Xtend® Soybeans

Roundup Ready 2 Xtend® Soybeans are built on the Genuity® Roundup Ready 2 Yield® soybean technology and growers will continue to maximize their yield opportunity through planting the new, elite genetics on their farm, as well as by using the weed management recommendations and incentives provided by Roundup Ready PLUS® Crop Management Solutions. Roundup Ready 2 Xtend Soybeans have tolerance to glyphosate and dicamba¹ herbicides.

Acceleron® Seed Applied Solutions

deliver exclusive active ingredients that matter. For more information, talk to your local retailer or visit acceleronsas.com.



Weed Management

Starting clean with a weed-free field and controlling subsequent weeds when they are small are critical steps to obtaining excellent weed control and maximum yield potential. The Roundup Ready Xtend Crop System provides the flexibility to use the diversity of herbicide tools necessary to control weeds before planting, at planting and in-crop. Failure to control weeds with the right rate, at the right time and with the right product, can lead to increased weed competition, the potential for selecting for herbicide resistance and possible decreased yield.

Spray labeled XtendiMax™ Herbicide with VaporGrip™ Technology in-crop from emergence (cracking) up to and including beginning bloom (R1) growth stage for unsurpassed weed control, proven crop safety and maximum yield potential. R1 stage soybeans end when there is an open flower at one of two uppermost main-stem nodes.

Recommendations

Follow all pesticide product labeling. If there is any conflict between these recommendations and applicable pesticide product labeling, the pesticide product labeling controls. Follow the recommendations below to help minimize the risk of developing glyphosate- and/or dicamba-resistant weed populations in a Roundup Ready 2 Yield or Roundup Ready 2 Xtend soybean system:

- Scout fields before and after each burndown and in-crop application.
- Start with a clean field, using either a burndown herbicide application, residual herbicide or tillage, making sure weeds are controlled at planting. Roundup WeatherMAX and XtendiMax Herbicide with VaporGrip Technology are products that can be used for a burndown application.



¹ Monsanto will not authorize the use of dicamba herbicides containing dicamba acid or the dimethylamine (DMA) salt of dicamba for use in Roundup Ready 2 Xtend soybeans even if EPA were to approve those herbicides for use in Roundup Ready 2 Xtend soybeans.

Roundup Ready 2 Xtend® Soybeans

- Include a soil-applied residual herbicide such as Rowel® Herbicide, Valor®, Rowel® FX Herbicide, Valor® XLT, Fierce®, Fierce® XLT, Gangster® or Authority® brand of products, applied at an appropriate rate as listed on the label.
- In-crop, apply Roundup WeatherMAX herbicide at a minimum of 22 oz/A or apply XtendiMax with VaporGrip Technology at 22 oz/A before weeds exceed 4" in height.
- If an additional flush of weeds occurs, apply a sequential application of Roundup WeatherMAX or XtendiMax with VaporGrip Technology at 22 oz/A before weeds exceed 4" in height.
- If using another approved glyphosate agricultural herbicide or dicamba herbicide, you must refer to the label booklet or supplemental labeling for the use of that product on Roundup Ready 2 Xtend Soybeans and follow the label directions.
- If using Roundup PowerMAX® or Roundup PowerMAX® II, application rates are the same as for Roundup WeatherMAX.
- Equipment should be cleaned before moving from field to field to help minimize the spread of weed seed.
- Report any incidence of repeated non-performance of Roundup agricultural herbicides or other glyphosate products on a particular weed to the appropriate company representative, local retailer or county extension agent.

Additional Information

Weeds such as lambsquarters, waterhemp, pigweed, and giant ragweed tend to emerge throughout the season. Sequential Roundup WeatherMAX applications or the addition of a soil residual herbicide may be required for control of subsequent weed flushes.

Various weed biotypes are known to be resistant to glyphosate. For the current weed control recommendations for glyphosate-resistant weed biotypes, refer to **RoundupReadyPLUS.com** or call 1-800-768-6387.

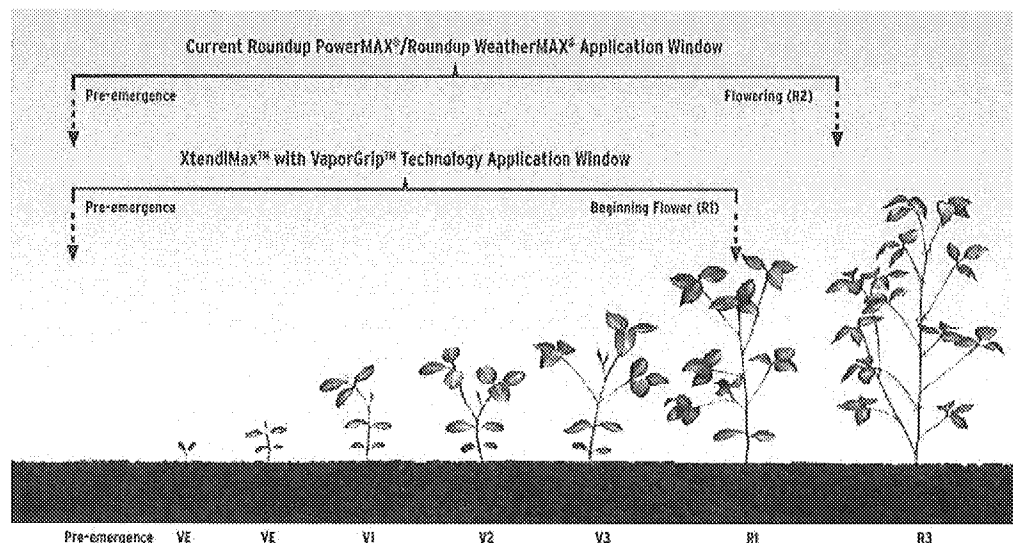
A complete list of specimen labels can be located at monsanto.com/products/Pages/msds-labels.aspx. Approved labels, including supplemental labeling, for Roundup agricultural herbicides must be in the possession of the user at the time of pesticide application and can be obtained by calling 1-800-768-6387 or by contacting your State Pesticide Lead Agency for more information.

Various weed biotypes are known to be resistant to other herbicides as well. Use herbicides and combinations of herbicides that will control the weed biotypes and species that are present on your farm.

XtendiMax™ with VaporGrip™ Technology

XtendiMax with VaporGrip Technology may only be tank-mixed with products that have been tested and found not to adversely affect the offsite movement potential of XtendiMax with VaporGrip Technology. A list of those products may be found at www.xtendimaxapplicationrequirements.com.

- May be applied in-crop, from crop emergence up to and including beginning bloom (R1) growth stage.
- Two 0.5 lb/A applications of dicamba may be made postemergence.
- Products must be applied in a minimum of 10 GPA carrier volume.
- Sequential applications postemergence may be made at least 7 days apart.
- No more than 2.0 lb/A of dicamba may be used, total, per growing season.
- For best results, dicamba based weed management programs must include the use of residual herbicides preemergence as well as at least one postemergence application.
- Report any incidence of non-performance of XtendiMax with VaporGrip Technology against a particular weed species to your Monsanto retailer, representative or call 1-844-RRXTEND.



Message

From: Jeffrey H Birk [jeffrey.birk@basf.com]
Sent: 9/6/2016 5:10:20 PM
To: Rowland, Grant [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=5b004bc79f1f40b0a181a584a8c64495-Rowland, Grant]
CC: Montague, Kathryn V. [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c50d485150734f6e85059d64dd80a353-Kathryn V. Montague]; John J Arthur [john.arthur@basf.com]; Richard L Braddock [richard.braddock@basf.com]; Ada M Breau [ada.breaux@basf.com]; Maximilian M Safarpour [maximilian.safarpour@basf.com]
Subject: RE: Proposed meeting with BASF
Attachments: EPA BASF Meeting ENGENIA Agenda.docx

Grant,

I have attached a short agenda for our 9:00 meeting this Thursday to discuss Engenia.

See you then,

Jeff

Jeffrey H. Birk, Ph.D.
Product Registration Manager

Phone: 919-547-2622 Mobile: 919-225-9220 E-Mail: jeffrey.birk@basf.com
Postal Address: 26 Davis Drive, RTP, NC 27709

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From: Rowland, Grant [mailto:Rowland.Grant@epa.gov]
Sent: Thursday, August 11, 2016 2:56 PM
To: Jeffrey H Birk <jeffrey.birk@basf.com>
Subject: RE: Proposed meeting with BASF

Hi Jeff,

I just wanted to let you know I got your message and have been working with upper management to get this meeting scheduled. I'll let you know as soon as we have a time and date for you.

-Grant

*Grant Rowland
Herbicide Branch
Registration Division
Office of Pesticide Programs
703-347-0254*

From: Jeffrey H Birk [mailto:jeffrey.birk@basf.com]
Sent: Friday, August 05, 2016 3:19 PM
To: Rowland, Grant <Rowland.Grant@epa.gov>
Cc: Ada M Breau <ada.breaux@basf.com>; John J Arthur <john.arthur@basf.com>; Richard L Braddock

<richard.braddock@basf.com>

Subject: Proposed meeting with BASF

Hello Grant,

Ada Breaux, has been speaking with Dan Kenny, and they agreed that it might be best if BASF could get together with a small group from EPA to talk through the pending DT use registration and Engenia herbicide. I can send a proposed agenda next week, but it would include a brief overview of what BASF has been doing to address concerns about dicamba volatility and potential synergy between dicamba and other herbicides. We would suggest that it may also be helpful to have an open discussion about the dicamba drift issues resulting from the illegal use of dicamba in DT crops this year, as well as the propose inadvertent dicamba residue tolerances. We would be happy to discuss any other issues or concerns that EPA is wrestling with over the proposed dicamba DT use decision.

Myself and two or three other individuals from BASF will participate in the meeting. In addition to yourself BASF would like to suggest that the following EPA individuals participate in the meeting:

Rick Keigwin
Mike Goodis
Dan Kenny
Kay Montague
Representatives from EFED

It would be great if we could find time to have the meeting within the next couple of weeks.

Please let me know if you have any questions, and thank you in advance to trying to setup this meeting.

Have a great weekend,

Jeff

Jeffrey H. Birk, Ph.D.
Product Registration Manager

Phone: 919-547-2622 Mobile: 919-225-9220 E-Mail: jeffrey.birk@basf.com
Postal Address: 26 Davis Drive, RTP, NC 27709

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EPA BASF Meeting ENGENIA™ September 8, 2016 Agenda

BASF Regulatory Attendance: Jack Arthur, Jeff Birk, Richard Braddock, Ada Breaux

- 1. Introduction - BASF's understanding of the status**
- 2. Tank Mixtures (Synergy) - What is the path forward?
(Halauxifen-methyl example)**
- 3. Spray Buffers: Wind directional vs. 360 degree**
- 4. Timelines and path forward to address label issues post
registration**
- 5. EPA's response to docket comments**

™Trademark of BASF

From: Jeffrey H Birk [jeffrey.birk@basf.com]
Sent: 4/1/2016 1:36:44 PM
To: Montague, Kathryn V. [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c50d485150734f6e85059d64dd80a353-Kathryn V. Montague]; Rowland, Grant [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=5b004bc79f1f40b0a181a584a8c64495-Rowland, Grant]; Corbin, Mark [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=1db182663b134e46b3fec580f8e0b5f2-Mark Corbin]
Subject: FW: EFSA - Outcome of the consultation with Member States, the applicant and EFSA on the pesticide risk assessment for dicamba in light of confirmatory data >> FYI
Attachments: 1008e.pdf
Importance: High

Mark, Kay and Grant,

FYI, this may be of interest to help support the low volatility risk for dicamba.

Congratulations on getting the comment period open.

Enjoy your weekend,

Jeff

Jeffrey H. Birk, Ph.D.
Product Registration Manager

Phone: 919-547-2622 Mobile: 919-225-9220 E-Mail: jeffrey.birk@basf.com
Postal Address: 26 Davis Drive, RTP, NC 27709

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Outcome of the consultation with Member States, the applicant and EFSA on the pesticide risk assessment for dicamba in light of confirmatory data

<http://www.efsa.europa.eu/en/supporting/pub/1008e>

Summary

Dicamba was included in Annex I to Directive 91/414/EEC on 1 January 2009 by Commission Directive 2008/69/EC, and has been deemed to be approved under Regulation (EC) No 1107/2009, in accordance with Commission Implementing Regulation (EU) No 540/2011, as amended by Commission Implementing Regulation (EU) No 541/2011. In 2011 the approval has been amended by Regulation (EU) No 1100/2011, following the peer review performed by EFSA (EFSA, 2011). It was a specific provision of the amended approval that the applicant was required to submit to the European Commission further studies in the area of environmental fate and behaviour by 30 November 2013.

In accordance with the specific provision, the applicant, Syngenta, submitted an updated dossier in November 2013, which was evaluated by the designated rapporteur Member State (RMS), Denmark, in the form of an addendum to the draft assessment report. In compliance with guidance document SANCO 5634/2009-rev.6.1, the RMS distributed the addendum to Member States, the applicant and EFSA for comments on 7 August 2015. The RMS collated all comments in the format of a reporting table, which was submitted to EFSA on 29 February 2016. EFSA added its scientific views on the specific points raised during the commenting phase in column 4 of the reporting table.

The current report summarises the outcome of the consultation process organised by the RMS, Denmark, and presents EFSA's scientific views and conclusions on the individual comments received.

All commenters agreed on the RMS evaluation and conclusions relating to the information provided by the applicant to address the confirmatory information requested by the European Commission.

Outcome of the consultation with Member States, the applicant and EFSA on the pesticide risk assessment for dicamba in light of confirmatory data

European Food Safety Authority (EFSA)

Abstract

The European Food Safety Authority (EFSA) was asked by the European Commission to provide scientific assistance with respect to the risk assessment for an active substance in light of confirmatory data requested following approval in accordance with Article 6(1) of Directive 91/414/EEC and Article 6(f) of Regulation (EC) No 1107/2009. In this context EFSA's scientific views on the specific points raised during the commenting phase conducted with Member States, the applicant and EFSA on the confirmatory data and their use in the risk assessment for dicamba are presented. The current report summarises the outcome of the consultation process organised by the rapporteur Member State Denmark and presents EFSA's scientific views and conclusions on the individual comments received.

© European Food Safety Authority, 2016

Keywords: dicamba, peer review, confirmatory data, risk assessment, pesticide, herbicide

Requestor: European Commission

Question number: EFSA-Q-2016-00162

Correspondence: pesticides.peerreview@efsa.europa.eu

Suggested citation: EFSA (European Food Safety Authority), 2016. Technical report on the outcome of the consultation with Member States, the applicant and EFSA on the pesticide risk assessment for dicamba in light of confirmatory data. EFSA supporting publication 2016:EN-1008. 9 pp.

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Summary

Dicamba was included in Annex I to Directive 91/414/EEC on 1 January 2009 by Commission Directive 2008/69/EC, and has been deemed to be approved under Regulation (EC) No 1107/2009, in accordance with Commission Implementing Regulation (EU) No 540/2011, as amended by Commission Implementing Regulation (EU) No 541/2011. In 2011 the approval has been amended by Regulation (EU) No 1100/2011, following the peer review performed by EFSA (EFSA, 2011). It was a specific provision of the amended approval that the applicant was required to submit to the European Commission further studies in the area of environmental fate and behaviour by 30 November 2013.

In accordance with the specific provision, the applicant, Syngenta, submitted an updated dossier in November 2013, which was evaluated by the designated rapporteur Member State (RMS), Denmark, in the form of an addendum to the draft assessment report. In compliance with guidance document SANCO 5634/2009-rev.6.1, the RMS distributed the addendum to Member States, the applicant and EFSA for comments on 7 August 2015. The RMS collated all comments in the format of a reporting table, which was submitted to EFSA on 29 February 2016. EFSA added its scientific views on the specific points raised during the commenting phase in column 4 of the reporting table.

The current report summarises the outcome of the consultation process organised by the RMS, Denmark, and presents EFSA's scientific views and conclusions on the individual comments received.

All commenters agreed on the RMS evaluation and conclusions relating to the information provided by the applicant to address the confirmatory information requested by the European Commission.

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1. Introduction

1.1. Background and Terms of Reference as provided by the requestor

Dicamba was included in Annex I to Directive 91/414/EEC¹ on 1 January 2009 by Commission Directive 2008/69/EC², and has been deemed to be approved under Regulation (EC) No 1107/2009³, in accordance with Commission Implementing Regulation (EU) No 540/2011⁴, as amended by Commission Implementing Regulation (EU) No 541/2011⁵. EFSA previously finalised a Conclusion on this active substance on 17 December 2010 (EFSA, 2011). Following the peer review performed by EFSA, the approval has been amended by Regulation (EU) No 1100/2011⁶.

It was a specific provision of the amended approval that the applicant was required to submit to the European Commission by 30 November 2013 further confirmatory information as regard:

- the identification and quantification of a group of soil transformation products formed in a soil incubation study;
- the potential for long range transport through the atmosphere.

In accordance with the specific provision, the applicant, Syngenta, submitted an updated dossier in November 2013, which was evaluated by the designated rapporteur Member State (RMS), Denmark, in the form of an addendum to the draft assessment report (Denmark, 2015). In compliance with guidance document SANCO 5634/2009-rev.6.1 (European Commission, 2013), the RMS distributed the addendum to Member States, the applicant and EFSA for comments on 7 August 2015. The RMS collated all comments in the format of a reporting table, which was submitted to EFSA on 29 February 2016. EFSA added its scientific views on the specific points raised during the commenting phase in column 4 of the reporting table.

The current report summarises the outcome of the consultation process organised by the RMS, Denmark, and presents EFSA's scientific views and conclusions on the individual comments received.

1.2. Interpretation of the Terms of Reference

On 22 December 2014 the European Commission requested EFSA to provide scientific assistance with respect to the risk assessment of confirmatory data following approval of an active substance in accordance with Article 6(1) of Directive 91/414/EEC and Article 6(f) of Regulation (EC) No 1107/2009. EFSA's scientific views on the specific points raised during the commenting phase conducted with Member States, the applicant and EFSA on the risk assessment of confirmatory data for dicamba are presented.

To this end, a technical report containing the finalised reporting table is being prepared by EFSA. The deadline for providing the finalised report is 29 March 2016.

On the basis of the reporting table, the European Commission may decide to further consult EFSA to conduct a full or focused peer review and to provide its conclusions on certain specific points.

¹ Council Directive 91/414/EEC of 15 July 1991 concerning the placing of plant protection products on the market. OJ L 230, 19.08.1991, p.1-32.

² Commission Directive 2008/69/EC of 1 July 2008 amending Council Directive 91/414/EEC to include clofentezine, dicamba, difenoconazole, diflubenzuron, imazaquin, lenacil, oxadiazon, picloram and pyriproxyfen as active substances (Text with EEA relevance). OJ L 172, 2.7.2008, p. 9–14.

³ Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC. OJ L 309, 24.11.2009, p. 1-50.

⁴ Commission Implementing Regulation (EU) No 540/2011 of 25 May 2011 implementing Regulation (EC) No 1107/2009 of the European Parliament and of the Council as regards the list of approved active substances. OJ L 153, 11.6.2011, p.1-186.

⁵ Commission Implementing Regulation (EU) No 541/2011 of 1 June 2011 amending Implementing Regulation (EU) No 540/2011 implementing Regulation (EC) No 1107/2009 of the European Parliament and of the Council as regards the list of approved active substances. OJ L 153, 11.6.2011, p.187-188.

⁶ Commission Implementing Regulation (EU) No 1100/2011 of 31 October 2011 amending Implementing Regulation (EU) No 540/2011 as regards the conditions of approval of the active substances dicamba, difenoconazole, and imazaquin Text with EEA relevance. OJ L 285, 1.11.2011, p. 10–14.

2. Assessment

The comments received on the pesticide risk assessment for the active substance dicamba in light of confirmatory data and the conclusions drawn by the EFSA are presented in the format of a reporting table.

The comments received are summarised in column 2 of the reporting table. The RMS' considerations of the comments are provided in column 3, while EFSA's scientific views and conclusions are outlined in column 4 of the table.

The finalised reporting table is provided in Appendix A of this report.

Documentation provided to EFSA

1. Denmark, 2015. Addendum to Volume 3 B8 of the assessment report on dicamba, confirmatory data, August 2015 updated February 2016. Available online: www.efsa.europa.eu.
2. Denmark, 2016. Reporting table, comments on the pesticide risk assessment for dicamba in light of confirmatory data, February 2016.

References

- EFSA (European Food Safety Authority), 2011. Conclusion on the peer review of the pesticide risk assessment of the active substance dicamba. EFSA Journal 2011;9(1):1965, 52 pp. doi:10.2903/j.efsa.2011.1965
- European Commission, 2013. Guidance document on the procedures for submission and assessment of confirmatory information following approval of an active substance in accordance with Regulation (EC) No 1107/2009. SANCO 5634/2009-rev. 6.1

Abbreviations

AR	applied radioactivity
DG SANCO	European Commission Directorate General Health and Consumers
EU	European Union
MS	Member State
RMS	rapporteur Member State
TLC	thin layer chromatography

Appendix A – Collation of comments from Member States, applicant and EFSA on the pesticide risk assessment for the active substance dicamba in light of confirmatory data and the conclusions drawn by EFSA on the specific points raised

4. Environmental fate and behaviour (B.8)

Route and rate of degradation in soil (B.8.1)				
No.	<u>Column 1</u> Reference to addendum to assessment report	<u>Column 2</u> Comments from Member States / applicant / EFSA	<u>Column 3</u> Evaluation by rapporteur Member State	<u>Column 4</u> EFSA's scientific views on the specific points raised in the commenting phase conducted on the RMS's assessment of confirmatory data
(1)	B.8 addendum August 2015, B.8.1.1.1 route of degradation in soil pages 3-10	EFSA: The RMS has provided a transparent evaluation of the information provided. EFSA agrees with the RMS conclusions.	RMS: EFSA agrees with our conclusions.	Addressed
(2)	Vol.B.8.1.1	NL: Agrees with the conclusion of the RMS. Point 2 raised by the applicant is not strong. By dividing the total amount in two or three equal amounts. At day 8 and day 16 one component of this TLC spot can be twice above 5 %. However, only indirect data is available to show that this is not the case. As already mentioned NL agrees with the conclusion of the RMS that it very unlikely that one metabolite of these TLC spots are above the 10% of the AR or twice above 5%.	RMS: NL agrees with our overall conclusion.	Addressed
(3)		FR: No comment.		Addressed
(4)	Vol. 3, B.8.1, Route and rate of degradation	Applicant: agrees with the RMS conclusions	RMS: Applicant agrees with our conclusions.	Addressed

FATE and behaviour in air (B.8.7)

No.	Column 1 Reference to addendum to assessment report	Column 2 Comments from Member States / applicant / EFSA	Column 3 Evaluation by rapporteur Member State	Column 4 EFSA's scientific views on the specific points raised in the commenting phase conducted on the RMS's assessment of confirmatory data
(1)	B.8 addendum August 2015, B.8.7.2 rate and route of degradation in air pages 10-12	EFSA: The RMS has provided a transparent evaluation of the information provided. EFSA agrees with the RMS conclusions.	RMS: EFSA agrees with our conclusions.	Addressed
(2)	Vol. B.8.7.2, p11	NL: Typo in the reference Monitoring_bestrijdingsmiddelen_operviaakte water (2000-2004) opperviaktewater should be opperviaktewater	RMS: A corrigendum to the addendum has been issued, with a correct reference to the Dutch monitoring data.	Addressed
(3)	Vol. B.8.7	NL: agrees with the RMS that long range transport is NOT a critical issue	RMS: NL agrees with our conclusion that Long range transport is not a concern.	Addressed
(4)		FR: No comment.		Addressed
(5)	Vol. 3, B.8.7.2 Summary of rate and route of degradation in air	Applicant: agrees with the RMS conclusions	RMS: Applicant agrees with our conclusions.	Addressed

Other comments

No.	Column 1 Reference to addendum to assessment report	Column 2 Comments from Member States / applicant / EFSA	Column 3 Evaluation by rapporteur Member State	Column 4 EFSA's scientific views on the specific points raised in the commenting phase conducted on the RMS's assessment of confirmatory data
5(1)	B.8. Addendum: Confirmatory Data	FR: Conclusions as proposed by RMS DK are agreed. Both points are considered as addressed.	RMS: FR agrees with our conclusions – both points are addressed.	Addressed

Message

From: Montague, Kathryn V. [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=C50D485150734F6E85059D64DD80A353-KATHRYN V. MONTAGUE]
Sent: 5/23/2017 5:21:09 PM
To: 'MARVIN, THOMAS [AG/1920]' [thomas.marvin@monsanto.com]
Subject: RE: Dicamba Updates?

Hi, Tom,

I didn't forget about you, just swamped. Trying to get answers for each of your questions, I will give you a call or email as soon as people have gotten back to me with the information.

Best Regards,
Kay

From: MARVIN, THOMAS [AG/1920] [mailto:thomas.marvin@monsanto.com]
Sent: Friday, May 19, 2017 3:23 PM
To: Montague, Kathryn V.
Subject: Dicamba Updates?

Kay,

Can we connect by phone today or early next week to touch base on: 1) status/PRIA for Roundup Xtend; 2) status of Roundup Xtend baseline query per my 5/6 email; 3) Dan mentioned last week that EPA had some label revisions to Xtendimax I should contact you about; and 4) status of outstanding synergy assessments for Xtendimax tank mixes per my 5/8 email. Our biggest priority is #1.

Thanks,

Tom

Tom Marvin
Director, Federal Regulatory Affairs
1300 I Street, NW
Washington, DC 20005
Cell: 314-308-6836
Desk: 314-694-7901

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Message

From: Montague, Kathryn V. [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=C50D485150734F6E85059D64DD80A353-KATHRYN V. MONTAGUE]
Sent: 4/10/2017 8:18:02 PM
To: BHAKTA, TINA [AG/1000] [tina.bhakta@monsanto.com]
Subject: RE: can we talk today?

Hi, Tina,

I don't have much of an update from EFED yet. I know they are still finalizing the veg vigor and field volatility DERs. Once they have those, the remaining work will be determining if the results of those studies cause the buffer to be increased or otherwise modified (e.g., 360 degrees vs wind-directional). Both Mark Corbin and Monica Wait are out of the office this week; I plan to have a discussion with them when they return next week, so we can see where we are with the Roundup Xtend timing.

I will look for the Cotoran email, and see if by chance we've already cleared dicamba + fluometuron for synergy. If not, I'll have to request that our reviewer add that to the list of ones he's working on, as there is no self-certification option at this point for the synergy clearance.

Best Regards,
Kay

From: BHAKTA, TINA [AG/1000] [mailto:tina.bhakta@monsanto.com]
Sent: Monday, April 10, 2017 9:24 AM
To: Montague, Kathryn V. <Montague.Kathryn@epa.gov>
Subject: can we talk today?

Hi Kay,

I know you are extremely busy but hoping that we can connect today. Wanted to understand whats left for RU Xtend as we really need to understand potential timing delays and I sent another email to approve us enabling one herbicide, cotoran, which has fluometuron as we have our wind tunnel data ready to submit- this is a product that is needed immediately for cotton in the south, there are no patents. I am happy to put in submission with us taking on the self-certification.

My mobile is best Cell Phone / Ex. 6 so let me know if we can connect, I can also talk to Grant if you would prefer.

Tina Bhakta Ph.D.
Global Chemistry Expansion Lead, Regulatory
Phone / Ex. 6
O: 314-694-8679

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Message

From: Montague, Kathryn V. [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=C50D485150734F6E85059D64DD80A353-KATHRYN V. MONTAGUE]
Sent: 4/25/2017 6:48:03 PM
To: Jeffrey H Birk [jeffrey.birk@basf.com]
CC: Grant Rowland [Rowland.Grant@epa.gov]
Subject: RE: Engenia premix with pyroxasulfone herbicide?

Hi, Jeff,

I'll need to run this by EFED. They pretty much require a standard set of data for everything with these uses/products, so I'm not sure you'll be able to not do the field flux testing, but I will let you know what they say.

Best Regards,
Kay

From: Jeffrey H Birk [mailto:jeffrey.birk@basf.com]
Sent: Tuesday, April 25, 2017 9:35 AM
To: Montague, Kathryn V. <Montague.Kathryn@epa.gov>
Cc: Rowland, Grant <Rowland.Grant@epa.gov>
Subject: Engenia premix with pyroxasulfone herbicide?

Hello Kay,

BASF is in the process of developing a new end-use-product containing the BAPMA salt of dicamba and pyroxasulfone herbicide for use in DT cotton and soybeans. BASF expects to be able to submit this new dicamba premix for registration in 1Q18. In putting the development program together, the question about the need for field flux testing came up. After discussing internally and considering any impact that this premix may have on the overall volatility characteristics of the BAPMA salt of dicamba, BASF has concluded that the volatility concern for this proposed premix would be no different than that for Engenia herbicide, and therefore, no additional field flux data should be required. The reasoning for this decision is as follows:

- The new product contains the BAPMA salt of dicamba, which has already been evaluated for field flux, as Engenia herbicide.
- Pyroxasulfone herbicide is not volatile.
- Pyroxasulfone is non-ionic and is not formulated as a salt
- There are no other salt forming components in the product formulation that can degrade the low volatility nature of the dicamba/BAPMA salt.
- There is no expectation that the volatility potential of this BAPMA salt of dicamba and pyroxasulfone herbicide premix will be different than Engenia.

Please let me know as soon as possible if EFED should disagree with this conclusion. Any required field flux studies will need to be conducted in 2017 to meet our 1Q18 submission target.

Thanks,

Jeff

Message

From: Montague, Kathryn V. [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=C50D485150734F6E85059D64DD80A353-KATHRYN V. MONTAGUE]
Sent: 5/23/2017 8:41:55 PM
To: MARVIN, THOMAS [AG/1920] [thomas.marvin@monsanto.com]
Subject: RE: Dicamba Updates?

Hi, Tom,

I do have a draft memo from them, just need to work out with Dan, Grant and EFED how much time we need to wrap everything up, then I'll get in touch with you about renegotiating. I confirmed we won't do public process on this one, so that makes it much faster.

Best Regards,
Kay

From: MARVIN, THOMAS [AG/1920] [mailto:thomas.marvin@monsanto.com]
Sent: Tuesday, May 23, 2017 4:38 PM
To: Montague, Kathryn V. <Montague.Kathryn@epa.gov>
Subject: RE: Dicamba Updates?

Thx Kay, and understand. Hopefully we can talk this week about #1. I am getting requests to escalate given the limited time to make 2018 production decisions.

Tom

----- Original Message -----

Subject: RE: Dicamba Updates?
From: "Montague, Kathryn V." <Montague.Kathryn@epa.gov>
Date: May 23, 2017, 12:21 PM
To: "MARVIN, THOMAS [AG/1920]" <thomas.marvin@monsanto.com>
Hi, Tom,

I didn't forget about you, just swamped. Trying to get answers for each of your questions, I will give you a call or email as soon as people have gotten back to me with the information.

Best Regards,
Kay

From: MARVIN, THOMAS [AG/1920] [mailto:thomas.marvin@monsanto.com]
Sent: Friday, May 19, 2017 3:23 PM
To: Montague, Kathryn V. <Montague.Kathryn@epa.gov>
Subject: Dicamba Updates?

Kay,

Can we connect by phone today or early next week to touch base on: 1) status/PRIA for Roundup Xtend; 2) status of Roundup Xtend baseline query per my 5/6 email; 3) Dan mentioned last week that EPA had some label revisions to Xtendimax I should contact you about; and 4) status of outstanding synergy assessments for Xtendimax tank mixes per my 5/8 email. Our biggest priority is #1.

Thanks,

Tom

Tom Marvin
Director, Federal Regulatory Affairs
1300 I Street, NW
Washington, DC 20005
Cell: 314-308-6836
Desk: 314-694-7901

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Message

From: Montague, Kathryn V. [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=C50D485150734F6E85059D64DD80A353-KATHRYN V. MONTAGUE]
Sent: 5/23/2017 8:02:55 PM
To: Jeffrey H Birk [jeffrey.birk@basf.com]
CC: Grant Rowland [Rowland.Grant@epa.gov]; Dan Kenny [Kenny.Dan@epa.gov]
Subject: RE: Engenia premix with pyroxasulfone herbicide?

Hi, Jeff,

EFED feels that your logic/rationale has merit, but would need additional information/data to support the claims before they could make a determination on waiving the field flux study. You may want to consider developing a "white paper" on it, with some data and/or citations of data to support your claims, and submitting that as a PRIA R124 (pre-application determination of waivers) before you finalize your submission plans.

Best Regards,
Kay

From: Jeffrey H Birk [mailto:jeffrey.birk@basf.com]
Sent: Tuesday, May 23, 2017 7:59 AM
To: Montague, Kathryn V. <Montague.Kathryn@epa.gov>
Cc: Rowland, Grant <Rowland.Grant@epa.gov>
Subject: RE: Engenia premix with pyroxasulfone herbicide?

Good Morning Kay,

Just checking to see if you had a chance to get a decision from EFED on the need for field flux data with a dicamba premix that would not be expected to be different from Engenia alone?

Thanks,

Jeff

From: Montague, Kathryn V. [mailto:Montague.Kathryn@epa.gov]
Sent: Tuesday, April 25, 2017 2:48 PM
To: Jeffrey H Birk <jeffrey.birk@basf.com>
Cc: Rowland, Grant <Rowland.Grant@epa.gov>
Subject: RE: Engenia premix with pyroxasulfone herbicide?

Hi, Jeff,

I'll need to run this by EFED. They pretty much require a standard set of data for everything with these uses/products, so I'm not sure you'll be able to not do the field flux testing, but I will let you know what they say.

Best Regards,
Kay

From: Jeffrey H Birk [mailto:jeffrey.birk@basf.com]
Sent: Tuesday, April 25, 2017 9:35 AM
To: Montague, Kathryn V. <Montague.Kathryn@epa.gov>

Cc: Rowland, Grant <Rowland.Grant@epa.gov>

Subject: Engenia premix with pyroxasulfone herbicide?

Hello Kay,

BASF is in the process of developing a new end-use-product containing the BAPMA salt of dicamba and pyroxasulfone herbicide for use in DT cotton and soybeans. BASF expects to be able to submit this new dicamba premix for registration in 1Q18. In putting the development program together, the question about the need for field flux testing came up. After discussing internally and considering any impact that this premix may have on the overall volatility characteristics of the BAPMA salt of dicamba, BASF has concluded that the volatility concern for this proposed premix would be no different than that for Engenia herbicide, and therefore, no additional field flux data should be required. The reasoning for this decision is as follows:

- The new product contains the BAPMA salt of dicamba, which has already been evaluated for field flux, as Engenia herbicide.
- Pyroxasulfone herbicide is not volatile.
- Pyroxasulfone is non-ionic and is not formulated as a salt
- There are no other salt forming components in the product formulation that can degrade the low volatility nature of the dicamba/BAPMA salt.
- There is no expectation that the volatility potential of this BAPMA salt of dicamba and pyroxasulfone herbicide premix will be different than Engenia.

Please let me know as soon as possible if EFED should disagree with this conclusion. Any required field flux studies will need to be conducted in 2017 to meet our 1Q18 submission target.

Thanks,

Jeff

Message

From: Montague, Kathryn V. [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=C50D485150734F6E85059D64DD80A353-KATHRYN V. MONTAGUE]
Sent: 11/18/2016 7:37:06 PM
To: CUBBAGE, JERRY W [AG/1000] [jerry.w.cubbage@monsanto.com]
CC: Rowland, Grant [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=5b004bc79f1f40b0a181a584a8c64495-Rowland, Grant]; NYANGULU, JAMES M [AG/1920] [james.m.nyangulu@monsanto.com]
Subject: Re: Roundup Xtend (EPA Reg. No 524-616) Fast Track Amendment Submission

Hi, Jerry,

You have a pending PRIA action on that, and I thought we were waiting for some additional plant data. I'm actually out of the office in sick leave now, but I will look into this further next week.

Thank you,
Kay

Sent from my iPhone

On Nov 18, 2016, at 2:06 PM, CUBBAGE, JERRY W [AG/1000] <jerry.w.cubbage@monsanto.com> wrote:

Kay and Grant,

I wanted to make you aware that yesterday (November 17, 2016) Monsanto submitted through the electronic portal a label extension to add dicamba tolerant soy and cotton uses as a fast track amendment to Roundup Xtend (M1769 Premix Herbicide) EPA Reg. No. 524-616.

We hope you can move quickly to finalized this label extension.

Please let me know if you have any questions.

Have great weekend.

Thanks
Jerry

*Jerry W. Cubbage, Ph.D.
Monsanto Company
800 N. Lindbergh Blvd.
C3518N/C3NA
Creve Coeur, MO 63167
Office: 314-694-7350
Cell: 636-236-8894
Email: jerry.w.cubbage@monsanto.com*

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From: Montague, Kathryn V. [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=C50D485150734F6E85059D64DD80A353-KATHRYN V. MONTAGUE]
Sent: 1/4/2017 8:03:14 PM
To: BHAKTA, TINA [AG/1000] [tina.bhakta@monsanto.com]
Subject: Re: Dicamba

Conference Line / Ex. 6

Sent from my iPhone

On Jan 4, 2017, at 3:01 PM, BHAKTA, TINA [AG/1000] <tina.bhakta@monsanto.com> wrote:

we cannot get on, the conference code is not valid.

Tina Bhakta Ph.D.

Global Chemistry Expansion Lead, Regulatory

From: Montague, Kathryn V. [mailto:Montague.Kathryn@epa.gov]
Sent: Wednesday, January 04, 2017 2:00 PM
To: BHAKTA, TINA [AG/1000] <tina.bhakta@monsanto.com>
Cc: Kenny, Daniel <Kenny.Dan@epa.gov>
Subject: Re: Dicamba

Ok will set up the line now

Sent from my iPhone

On Jan 4, 2017, at 2:59 PM, BHAKTA, TINA [AG/1000] <tina.bhakta@monsanto.com> wrote:

We will talk discuss all that you have suggested with exception of volatility. So we will need efed. I can ask about the label questions off line with you.

Tina Bhakta Ph.D.

Global Chemistry Expansion Lead, Regulatory

From: Montague, Kathryn V. [mailto:Montague.Kathryn@epa.gov]
Sent: Wednesday, January 04, 2017 1:58 PM
To: BHAKTA, TINA [AG/1000] <tina.bhakta@monsanto.com>
Cc: Kenny, Daniel <Kenny.Dan@epa.gov>
Subject: RE: Dicamba

Hi, Tina,

So do you no longer need EFED for this meeting? Sounds like more of a labeling question.

We can't really discuss another company's labeling with you. We've noted the concerns you pointed out in your voicemail to Dan, and we will look into those. Are there more? If we're not going to discuss the volatility or drift topics, not sure if we still need this call?

Best Regards,
Kay

From: BHAKTA, TINA [AG/1000] [<mailto:tina.bhakta@monsanto.com>]
Sent: Wednesday, January 04, 2017 12:46 PM
To: Montague, Kathryn V. <Montague.Kathryn@epa.gov>
Subject: RE: Dicamba

Thanks Kay;

Since we do not have much time can we not discuss the volatility protocol today?? We have been working with all of our partners to ensure that they are following the same stewardship as us, only moving those products forward that will not cause an issue from a volatility stand point.

We would like to discuss a couple of items on the newly approved engenia label on differences that were not reflected on our Xtendimax label that can apply to our label too. And an update on the Round up Xtend data review.

Thanks and talk to you soon

Tina Bhakta Ph.D.
Global Chemistry Expansion Lead, Regulatory

From: Montague, Kathryn V. [<mailto:Montague.Kathryn@epa.gov>]
Sent: Tuesday, January 03, 2017 4:29 PM
To: BHAKTA, TINA [AG/1000] <tina.bhakta@monsanto.com>
Subject: RE: Dicamba

Hi, Tina,

It will be RD (me, Dan, Grant) and EFED (Mark Corbin, Monica Wait, Chuck Peck, and possibly others). Based on our previous conversations, I believe we should be discussing:

- <!--[if !supportLists]--><!--[endif]-->Revisions to Appendix A (the drift protocol for tank mixes) to use data for M1768 as the "baseline" vs data for M1691
- <!--[if !supportLists]--><!--[endif]-->Possibility and process for adding a volatility protocol and testing requirement for tank mix partners
- <!--[if !supportLists]--><!--[endif]-->Status of the tank mix data you've already submitted

Does that agree with your understanding/expectations?

Best Regards,
Kay

From: BHAKTA, TINA [AG/1000] [<mailto:tina.bhakta@monsanto.com>]
Sent: Tuesday, January 03, 2017 4:48 PM
To: Montague, Kathryn V. <Montague.Kathryn@epa.gov>; NYANGULU, JAMES M

[AG/1920] <james.m.nyangulu@monsanto.com>; Kenny, Daniel <Kenny.Dan@epa.gov>

Subject: RE: Dicamba

Hi Kay,

Happy new year! I hope you had a good break.

Can you let us know who else will be attending this call? Is this to discuss the tank mixing protocol?

Thanks

Tina Bhakta Ph.D.

Global Chemistry Expansion Lead, Regulatory

From: Montague, Kathryn V. [mailto:Montague.Kathryn@epa.gov]

Sent: Tuesday, January 03, 2017 2:03 PM

To: NYANGULU, JAMES M [AG/1920] <james.m.nyangulu@monsanto.com>; Kenny, Daniel <Kenny.Dan@epa.gov>; BHAKTA, TINA [AG/1000] <tina.bhakta@monsanto.com>

Subject: RE: Dicamba

Hi, James,

We can't use Webex...please call us using the following information:

Dial-in 1 **Phone / Ex. 6**

Conf cod **Phone / Ex. 6**

-----Original Appointment-----

From: NYANGULU, JAMES M [AG/1920] [mailto:james.m.nyangulu@monsanto.com]

Sent: Wednesday, December 14, 2016 1:34 PM

To: NYANGULU, JAMES M [AG/1920]; Montague, Kathryn V.; Kenny, Daniel; BHAKTA, TINA [AG/1000]

Subject: Dicamba

When: Wednesday, January 04, 2017 3:00 PM-3:30 PM (UTC-05:00) Eastern Time (US & Canada).

Where: WebEx

When: Wednesday, January 04, 2017 3:00 PM-3:30 PM (UTC-05:00) Eastern Time (US & Canada).

Where: WebEx

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Message

From: Montague, Kathryn V. [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=C50D485150734F6E85059D64DD80A353-KATHRYN V. MONTAGUE]
Sent: 1/4/2017 7:58:04 PM
To: BHAKTA, TINA [AG/1000] [tina.bhakta@monsanto.com]
CC: Dan Kenny [Kenny.Dan@epa.gov]
Subject: RE: Dicamba

Hi, Tina,

So do you no longer need EFED for this meeting? Sounds like more of a labeling question.

We can't really discuss another company's labeling with you. We've noted the concerns you pointed out in your voicemail to Dan, and we will look into those. Are there more? If we're not going to discuss the volatility or drift topics, not sure if we still need this call?

Best Regards,
Kay

From: BHAKTA, TINA [AG/1000] [mailto:tina.bhakta@monsanto.com]
Sent: Wednesday, January 04, 2017 12:46 PM
To: Montague, Kathryn V. <Montague.Kathryn@epa.gov>
Subject: RE: Dicamba

Thanks Kay;

Since we do not have much time can we not discuss the volatility protocol today?? We have been working with all of our partners to ensure that they are following the same stewardship as us, only moving those products forward that will not cause an issue from a volatility stand point.

We would like to discuss a couple of items on the newly approved engenia label on differences that were not reflected on our Xtendimax label that can apply to our label too. And an update on the Round up Xtend data review.

Thanks and talk to you soon

Tina Bhakta Ph.D.
Global Chemistry Expansion Lead, Regulatory

From: Montague, Kathryn V. [mailto:Montague.Kathryn@epa.gov]
Sent: Tuesday, January 03, 2017 4:29 PM
To: BHAKTA, TINA [AG/1000] <tina.bhakta@monsanto.com>
Subject: RE: Dicamba

Hi, Tina,

It will be RD (me, Dan, Grant) and EFED (Mark Corbin, Monica Wait, Chuck Peck, and possibly others). Based on our previous conversations, I believe we should be discussing:

- Revisions to Appendix A (the drift protocol for tank mixes) to use data for M1768 as the "baseline" vs data for M1691
- Possibility and process for adding a volatility protocol and testing requirement for tank mix partners

- Status of the tank mix data you've already submitted

Does that agree with your understanding/expectations?

Best Regards,
Kay

From: BHAKTA, TINA [AG/1000] [<mailto:tina.bhakta@monsanto.com>]
Sent: Tuesday, January 03, 2017 4:48 PM
To: Montague, Kathryn V. <Montague.Kathryn@epa.gov>; NYANGULU, JAMES M [AG/1920] <james.m.nyangulu@monsanto.com>; Kenny, Daniel <Kenny.Dan@epa.gov>
Subject: RE: Dicamba

Hi Kay,

Happy new year! I hope you had a good break.

Can you let us know who else will be attending this call? Is this to discuss the tank mixing protocol?

Thanks

Tina Bhakta Ph.D.
Global Chemistry Expansion Lead, Regulatory

From: Montague, Kathryn V. [<mailto:Montague.Kathryn@epa.gov>]
Sent: Tuesday, January 03, 2017 2:03 PM
To: NYANGULU, JAMES M [AG/1920] <james.m.nyangulu@monsanto.com>; Kenny, Daniel <Kenny.Dan@epa.gov>; BHAKTA, TINA [AG/1000] <tina.bhakta@monsanto.com>
Subject: RE: Dicamba

Hi, James,

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Dial-in **Phone / Ex. 6**

Conf code: **Phone / Ex. 6**

-----Original Appointment-----

From: NYANGULU, JAMES M [AG/1920] [<mailto:james.m.nyangulu@monsanto.com>]
Sent: Wednesday, December 14, 2016 1:34 PM
To: NYANGULU, JAMES M [AG/1920]; Montague, Kathryn V.; Kenny, Daniel; BHAKTA, TINA [AG/1000]
Subject: Dicamba
When: Wednesday, January 04, 2017 3:00 PM-3:30 PM (UTC-05:00) Eastern Time (US & Canada).
Where: WebEx

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Where: WebEx

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Meeting Number: **Phone / Ex. 6**

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From: Montague, Kathryn V. [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=C50D485150734F6E85059D64DD80A353-KATHRYN V. MONTAGUE]
Sent: 1/3/2017 10:28:39 PM
To: BHAKTA, TINA [AG/1000] [tina.bhakta@monsanto.com]
Subject: RE: Dicamba

Hi, Tina,

It will be RD (me, Dan, Grant) and EFED (Mark Corbin, Monica Wait, Chuck Peck, and possibly others). Based on our previous conversations, I believe we should be discussing:

- Revisions to Appendix A (the drift protocol for tank mixes) to use data for M1768 as the "baseline" vs data for M1691
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- Status of the tank mix data you've already submitted

Does that agree with your understanding/expectations?

Best Regards,
Kay

From: BHAKTA, TINA [AG/1000] [mailto:tina.bhakta@monsanto.com]
Sent: Tuesday, January 03, 2017 4:48 PM
To: Montague, Kathryn V. <Montague.Kathryn@epa.gov>; NYANGULU, JAMES M [AG/1920] <james.m.nyangulu@monsanto.com>; Kenny, Daniel <Kenny.Dan@epa.gov>
Subject: RE: Dicamba

Hi Kay,

Happy new year! I hope you had a good break.

Can you let us know who else will be attending this call? Is this to discuss the tank mixing protocol?

Thanks

Tina Bhakta Ph.D.
Global Chemistry Expansion Lead, Regulatory

From: Montague, Kathryn V. [mailto:Montague.Kathryn@epa.gov]
Sent: Tuesday, January 03, 2017 2:03 PM
To: NYANGULU, JAMES M [AG/1920] <james.m.nyangulu@monsanto.com>; Kenny, Daniel <Kenny.Dan@epa.gov>; BHAKTA, TINA [AG/1000] <tina.bhakta@monsanto.com>
Subject: RE: Dicamba

Hi, James,

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Conf code **Phone / Ex. 6**

-----Original Appointment-----

From: NYANGULU, JAMES M [AG/1920] [mailto:james.m.nyangulu@monsanto.com]

Sent: Wednesday, December 14, 2016 1:34 PM

To: NYANGULU, JAMES M [AG/1920]; Montague, Kathryn V.; Kenny, Daniel; BHAKTA, TINA [AG/1000]

Subject: Dicamba

When: Wednesday, January 04, 2017 3:00 PM-3:30 PM (UTC-05:00) Eastern Time (US & Canada).

Where: WebEx

When: Wednesday, January 04, 2017 3:00 PM-3:30 PM (UTC-05:00) Eastern Time (US & Canada).

Where: WebEx

Note: The GMT offset above does not reflect daylight saving time adjustments.

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Call-in toll-free number (US/Canada)

Call-in toll number (US/Canada)

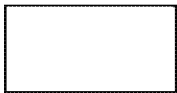
Meeting Number

Phone / Ex. 6

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Message

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Sent: 2/10/2017 1:26:11 PM
To: CUBBAGE, JERRY W [AG/1000] [jerry.w.cubbage@monsanto.com]; Rowland, Grant [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=5b004bc79f1f40b0a181a584a8c64495-Rowland, Grant]
CC: NYANGULU, JAMES M [AG/1920] [james.m.nyangulu@monsanto.com]; Dan Kenny [Kenny.Dan@epa.gov]
Subject: RE: HRM Educational plan submission for Xtendimax with VaporGrip Technology (EPA Reg. No. 524-617)

Thank you, Jerry, confirming receipt of your Educational Plan.

Best Regards,
Kay

From: CUBBAGE, JERRY W [AG/1000] [mailto:jerry.w.cubbage@monsanto.com]
Sent: Thursday, February 09, 2017 6:44 PM
To: Montague, Kathryn V. <Montague.Kathryn@epa.gov>; Rowland, Grant <Rowland.Grant@epa.gov>
Cc: NYANGULU, JAMES M [AG/1920] <james.m.nyangulu@monsanto.com>
Subject: HRM Educational plan submission for Xtendimax with VaporGrip Technology (EPA Reg. No. 524-617)

Kay and Grant,

Good evening, I tried today to submit our Educational Plan on Herbicide Resistance Management per the Terms and Condition of Registration Appendix D for Xtendimax with VaporGrip Technology uses on dicamba tolerant soybeans and cotton (EPA Reg. No. 524-617, Decision No. 522837, 516207, and 511766) and the Educational plan got corrupted in the upload to the electronic submission portal. I will have our document specialist try the upload tomorrow again.

Please find a courtesy copy of the cover letter, 8570-1 form, and Educational Plan.

Please let me know that you have received these documents at your earliest convenience.

Thanks
Jerry

Jerry W. Cubbage, Ph.D.
Monsanto Company
800 N. Lindbergh Blvd.
C3518N/C3NA
Creve Coeur, MO 63167
Office: 314-694-7350
Cell: 636-236-8894
Email: jerry.w.cubbage@monsanto.com

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Message

From: Montague, Kathryn V. [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=C50D485150734F6E85059D64DD80A353-KATHRYN V. MONTAGUE]
Sent: 2/7/2017 9:53:12 PM
To: BHAKTA, TINA [AG/1000] [tina.bhakta@monsanto.com]
CC: Dan Kenny [Kenny.Dan@epa.gov]; Grant Rowland [Rowland.Grant@epa.gov]
Subject: Roundup Xtend (352-616)

Hi, Tina,

Sorry I'm late answering your voice message, I've been running between meetings all day. Since we didn't reach an agreement on the renegotiation date, the action has fallen out of PRIA. That said, EFED is still expecting the vegetative vigor study review back from the contractor by mid-February, and the field deposition data hopefully at the same time or shortly thereafter. The veg vigor is of course critical in determining how much additional work is remaining to reach a decision on the premix product. As we discussed previously, if the mix of glyphosate + dicamba DGA is more phytotoxic than the DGA alone, significant rework may be required to calculate a buffer distance that remains protective. If it shows comparable or less phytotoxicity than the DGA endpoint, the study can give you a green light on the synergy requirement for dicamba DGA + glyphosate. We will let you know as soon as possible what our findings are on that, but I can't give you a meaningful answer on the exact timing at this point. We'll still need to have your self-certification on the drift part of the tank-mix requirements, however, before you can add glyphosate to your website as an Xtendimax tank mix partner. The drift study needs to be done per the Appendix A instructions on the Xtendimax registration document. Is this something Monsanto has already submitted?

As far as addressing your request to modify the baseline used in the Appendix A protocol, this is better addressed through a separate PRIA submission. EFED will need to look at several pieces of data to make a determination on this, and it seems cleaner to handle it on a separate track than to try to roll it in with the other parts of the determination on the premix product.

I'm about to head out of the office for today, but I will be in the office the rest of the week if you would like to discuss any of this further.

Best Regards,
Kay

Appointment

From: Keigwin, Richard [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=151BAABB6A2246A3A312F12A706C0A05-RICHARD P KEIGWIN JR]
Sent: 8/17/2016 10:16:22 PM
To: Keigwin, Richard [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=151baabb6a2246a3a312f12a706c0a05-Richard P Keigwin Jr]; Rowland, Grant [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=5b004bc79f1f40b0a181a584a8c64495-Rowland, Grant]; Goodis, Michael [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=50ed0b92dc4945b7a808fe8dbc9224f0-Michael Goodis]; Kenny, Daniel [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=1be9bb592f144269bcd41dd3a6d8a6d4-Daniel C. Kenny]; Montague, Kathryn V. [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c50d485150734f6e85059d64dd80a353-Kathryn V. Montague]; Cowles, James [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=684502c4acad4894b1fed6fae1c6d74d-Cowles, James]; Ada M Breaux [ada.breaux@basf.com]; John J Arthur [john.arthur@basf.com]; Richard L Braddock [richard.braddock@basf.com]
Subject: Meeting with BASF
Location: S12621
Start: 9/8/2016 1:00:00 PM
End: 9/8/2016 2:00:00 PM
Show Time As: Busy

Ada, John and Richard,

Please call (703) 305-7090 when you arrive, and someone will meet you in the lobby.

Meeting Background below:

From: Jeffrey H Birk [mailto:jeffrey.birk@basf.com]
Sent: Friday, August 05, 2016 3:19 PM
To: Rowland, Grant <Rowland.Grant@epa.gov>
Cc: Ada M Breaux <ada.breaux@basf.com>; John J Arthur <john.arthur@basf.com>; Richard L Braddock <richard.braddock@basf.com>
Subject: Proposed meeting with BASF

Hello Grant,

Ada Breaux, has been speaking with Dan Kenny, and they agreed that it might be best if BASF could get together with a small group from EPA to talk through the pending DT use registration and Engenia herbicide. I can send a proposed agenda next week, but it would include a brief overview of what BASF has been doing to address concerns about dicamba volatility and potential synergy between dicamba and other herbicides. We would suggest that it may also be helpful to have an open discussion about the dicamba drift issues resulting from the illegal use of dicamba in DT crops this year, as well as the propose inadvertent dicamba residue tolerances. We would be happy to discuss any other issues or concerns that EPA is wrestling with over the proposed dicamba DT use decision.

Myself and two or three other individuals from BASF will participate in the meeting. In addition to yourself BASF would like to suggest that the following EPA individuals participate in the meeting:

Rick Keigwin
Mike Goodis
Dan Kenny
Kay Montague
Representatives from EFED

It would be great if we could find time to have the meeting within the next couple of weeks.

Please let me know if you have any questions, and thank you in advance to trying to setup this meeting.

Have a great weekend,

Jeff

Jeffrey H. Birk, Ph.D.
Product Registration Manager

Phone: 919-547-2622 Mobile: 919-225-9220 E-Mail: jeffrey.birk@basf.com
Postal Address: 26 Davis Drive, RTP, NC 27709

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Message

From: CUBBAGE, JERRY W [AG/1000] [jerry.w.cubbage@monsanto.com]
Sent: 10/5/2017 2:20:08 PM
To: Rowland, Grant [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=5b004bc79f1f40b0a181a584a8c64495-Rowland, Grant]
CC: MARVIN, THOMAS [AG/1920] [thomas.marvin@monsanto.com]
Subject: RE: Master Label Amendment: Xtendimax with VaporGrip Technology EPA Reg. No. 524-617

Grant,

Thanks for your email. We appreciate your efforts in promptly reviewing.

We believe we have addressed the large majority of the changes you have suggested, in going back through your comments, it looks like there are only a handful of changes we didn't make. We would be happy to discussed the differences directly at your earliest convenience.

Thanks

Jerry

Jerry W. Cubbage, Ph.D.

Monsanto Company

700 Chesterfield Parkway West

FF4326C

Chesterfield, MO 63017

Office: 636-737-9574

Cell: 636-236-8894

Email: jerry.w.cubbage@monsanto.com

From: Rowland, Grant [mailto:Rowland.Grant@epa.gov]
Sent: Wednesday, October 04, 2017 8:47 PM
To: CUBBAGE, JERRY W [AG/1000] <jerry.w.cubbage@monsanto.com>
Subject: RE: Master Label Amendment: Xtendimax with VaporGrip Technology EPA Reg. No. 524-617

Hi Jerry,

I wanted to write back and confirm that we received your email with the Dicamba package and label. Thank you for that. We are currently reviewing the label and should get back to you with our comments by tomorrow.

One question, I noticed there were a number of areas within the label that did not include the changes that we discussed during our call last week. Was there any reason for not including the number of the changes we discussed? If you have any justification for leaving them out, it may help in our review. Thank you.

-Grant

Grant Rowland

Herbicide Branch

Registration Division

Office of Pesticide Programs

703-347-0254

From: CUBBAGE, JERRY W [AG/1000] [<mailto:jerry.w.cubbage@monsanto.com>]

Sent: Wednesday, October 04, 2017 2:08 PM

To: Montague, Kathryn V. <Montague.Kathryn@epa.gov>; Rowland, Grant <Rowland.Grant@epa.gov>; Meadows, Sarah <Meadows.Sarah@epa.gov>

Cc: MARVIN, THOMAS [AG/1920] <thomas.marvin@monsanto.com>; BHAKTA, TINA [AG/1000] <tina.bhakta@monsanto.com>

Subject: Master Label Amendment: Xtendimax with VaporGrip Technology EPA Reg. No. 524-617

Kay, Grant and Sarah,

Please find attached a courtesy copy of our submission (8570-1, Cover letter, and Amended Master Label). The submission was completed through the portal (see the attached portal summary).

Please let me know if you have any questions in your review of the Amended Master Label.

Thanks

Jerry

*Jerry W. Cubbage, Ph.D.
Monsanto Company
700 Chesterfield Parkway West
FF4326C
Chesterfield, MO 63017
Office: 636-737-9574
Cell: 636-236-8894
Email: jerry.w.cubbage@monsanto.com*

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Message

From: Rowland, Grant [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=5B004BC79F1F40B0A181A584A8C64495-ROWLAND, GRANT]
Sent: 10/5/2017 1:47:23 AM
To: CUBBAGE, JERRY W [AG/1000] [jerry.w.cubbage@monsanto.com]
Subject: RE: Master Label Amendment: Xtendimax with VaporGrip Technology EPA Reg. No. 524-617

Hi Jerry,

I wanted to write back and confirm that we received your email with the Dicamba package and label. Thank you for that. We are currently reviewing the label and should get back to you with our comments by tomorrow.

One question, I noticed there were a number of areas within the label that did not include the changes that we discussed during our call last week. Was there any reason for not including the number of the changes we discussed? If you have any justification for leaving them out, it may help in our review. Thank you.

-Grant

*Grant Rowland
Herbicide Branch
Registration Division
Office of Pesticide Programs
703-347-0254*

From: CUBBAGE, JERRY W [AG/1000] [mailto:jerry.w.cubbage@monsanto.com]
Sent: Wednesday, October 04, 2017 2:08 PM
To: Montague, Kathryn V. <Montague.Kathryn@epa.gov>; Rowland, Grant <Rowland.Grant@epa.gov>; Meadows, Sarah <Meadows.Sarah@epa.gov>
Cc: MARVIN, THOMAS [AG/1920] <thomas.marvin@monsanto.com>; BHAKTA, TINA [AG/1000] <tina.bhakta@monsanto.com>
Subject: Master Label Amendment: Xtendimax with VaporGrip Technology EPA Reg. No. 524-617

Kay, Grant and Sarah,

Please find attached a courtesy copy of our submission (8570-1, Cover letter, and Amended Master Label). The submission was completed through the portal (see the attached portal summary).

Please let me know if you have any questions in your review of the Amended Master Label.

Thanks
Jerry

*Jerry W. Cubbage, Ph.D.
Monsanto Company
700 Chesterfield Parkway West
FF4326C
Chesterfield, MO 63017
Office: 636-737-9574
Cell: 636-236-8894
Email: jerry.w.cubbage@monsanto.com*

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Message

From: Montague, Kathryn V. [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=C50D485150734F6E85059D64DD80A353-KATHRYN V. MONTAGUE]
Sent: 4/25/2017 6:48:03 PM
To: Jeffrey H Birk [jeffrey.birk@basf.com]
CC: Rowland, Grant [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=5b004bc79f1f40b0a181a584a8c64495-Rowland, Grant]
Subject: RE: Engenia premix with pyroxasulfone herbicide?

Hi, Jeff,

I'll need to run this by EFED. They pretty much require a standard set of data for everything with these uses/products, so I'm not sure you'll be able to not do the field flux testing, but I will let you know what they say.

Best Regards,
Kay

From: Jeffrey H Birk [mailto:jeffrey.birk@basf.com]
Sent: Tuesday, April 25, 2017 9:35 AM
To: Montague, Kathryn V. <Montague.Kathryn@epa.gov>
Cc: Rowland, Grant <Rowland.Grant@epa.gov>
Subject: Engenia premix with pyroxasulfone herbicide?

Hello Kay,

BASF is in the process of developing a new end-use-product containing the BAPMA salt of dicamba and pyroxasulfone herbicide for use in DT cotton and soybeans. BASF expects to be able to submit this new dicamba premix for registration in 1Q18. In putting the development program together, the question about the need for field flux testing came up. After discussing internally and considering any impact that this premix may have on the overall volatility characteristics of the BAPMA salt of dicamba, BASF has concluded that the volatility concern for this proposed premix would be no different than that for Engenia herbicide, and therefore, no additional field flux data should be required. The reasoning for this decision is as follows:

- The new product contains the BAPMA salt of dicamba, which has already been evaluated for field flux, as Engenia herbicide.
- Pyroxasulfone herbicide is not volatile.
- Pyroxasulfone is non-ionic and is not formulated as a salt
- There are no other salt forming components in the product formulation that can degrade the low volatility nature of the dicamba/BAPMA salt.
- There is no expectation that the volatility potential of this BAPMA salt of dicamba and pyroxasulfone herbicide premix will be different than Engenia.

Please let me know as soon as possible if EFED should disagree with this conclusion. Any required field flux studies will need to be conducted in 2017 to meet our 1Q18 submission target.

Thanks,

Jeff

Message

From: CUBBAGE, JERRY W [AG/1000] [jerry.w.cubbage@monsanto.com]
Sent: 8/16/2016 4:16:58 PM
To: Rowland, Grant [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=5b004bc79f1f40b0a181a584a8c64495-Rowland, Grant]
CC: NYANGULU, JAMES M [AG/1920] [james.m.nyangulu@monsanto.com]
Subject: RE: Notification to Registrations (EPA Reg. # 524-616 and 524-617)
Attachments: EPA acknowledgement brand 524-616.pdf; EPA acknowledgement brand 524-617.20141002.pdf

Grant,

Please find attached the alternate brand name acknowledgements for EPA Reg. #s 524-616 and 524-617 for you to help verify.

I look forward to hearing from you by the end of the day.

Please let me know if you have additional questions.

Thanks,
Jerry

From: Rowland, Grant [mailto:Rowland.Grant@epa.gov]
Sent: Tuesday, August 16, 2016 8:46 AM
To: CUBBAGE, JERRY W [AG/1000]
Cc: NYANGULU, JAMES M [AG/1920]
Subject: RE: Notification to Registrations (EPA Reg. # 524-616 and 524-617)

Hello:

I understand that these two notifications are of importance to you, and while I am trying to work through them as quickly as possible, I have been held up by my management while they discuss the accuracy of your requested alternate brand name. I do understand that this name has already been approved, however that decision was made prior to recent concerns regarding the Dicamba/Vapor Grip name and the proposed over-the-top uses.

I should have word from my management by the end of the day today and will immediately let you know what they have decided. Thank you.

-Grant

*Grant Rowland
Herbicide Branch
Registration Division
Office of Pesticide Programs
703-347-0254*

From: NYANGULU, JAMES M [AG/1920] [mailto:james.m.nyangulu@monsanto.com]
Sent: Tuesday, August 16, 2016 8:09 AM
To: Rowland, Grant <Rowland.Grant@epa.gov>
Cc: Montague, Kathryn V. <Montague.Kathryn@epa.gov>
Subject: Notification to Registrations (EPA Reg. # 524-616 and 524-617)
Importance: High

Hi Grant,

I am just following up on your correspondence with Jerry Cubbage with respect to these two registration which required minor amendments.

1. Updating registration number
2. Adding a previously approved brand name
3. Minor change to the warranty language.

According to Jerry, these were expected sometime in July. Kindly let me know the status of these registration amendments.

Thanks again for your help with this.

James Nyangulu

US Agency Regulatory Affairs Manager
202-383-2866 (Office)
202-304-6594 (Cell)

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460



OFFICE OF CHEMICAL SAFETY
AND POLLUTION PREVENTION

October 31, 2014

Helen E. Mero
Regulatory Affairs Manager
Monsanto Company
1300 I (Eye) Street, NW
Suite 450 East
Washington, DC 20005

Subject: Label Notification per PRN 98-10 – Addition of Alternate Brand Name
Product Name: M1769 Premix Herbicide
EPA Registration Number: 524-616
Application Date: September 25, 2014
Decision Number: 495845

Dear Ms. Mero:

The Agency is in receipt of your Application for Pesticide Notification under Pesticide Registration Notice (PRN) 98-10 for the above referenced product. The Registration Division (RD) has conducted a review of this request for its applicability under PRN 98-10 and finds that the action requested falls within the scope of PRN 98-10.

The alternate brand name Roundup Xtend with VaporGrip Technology has been added to the product record.

If you have any questions, you may contact Emily Schmid at 703-347-0189 or via email at schmid.emily@epa.gov.

Sincerely,

A handwritten signature in black ink that reads "Emily Schmid for".

Mindy Ondish, Acting Product Manager 25
Herbicide Branch
Registration Division (7505P)
Office of Pesticide Programs



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460

OFFICE OF CHEMICAL SAFETY
AND POLLUTION PREVENTION

October 2, 2014

Helen Mero
Regulatory Affairs Manager
Monsanto Company
1300 I Street, NW, Suite 450 East
Washington, DC 20005

Subject: Notification per PRN 98-10 – Alternate Brand Name
Product Name: M1768 Herbicide
EPA Registration Number: 524-617
Application Date: September 25, 2014
Decision Number: 495977

Dear Ms. Mero:

The Agency is in receipt of your Application for Pesticide Notification under Pesticide Registration Notice (PRN) 98-10 for the above referenced product. The Registration Division (RD) has conducted a review of this request for its applicability under PRN 98-10 and finds that the action requested falls within the scope of PRN 98-10.

The alternate brand name "**XtendiMax With VaporGrip Technology**" for this product has been added to our records.

This notification acknowledgement will be uploaded to the Pesticide Product Label System (PPLS) without a label.

If you have any questions, please contact Mindy Ondish at (703)605-0723 or at ondish.mindy@epa.gov.

Sincerely,

A handwritten signature in cursive script that reads "Mindy Ondish" followed by the word "for" and a small box containing the letter "r".

Kathryn V. Montague, Product Manager 23
Herbicide Branch
Registration Division (7505P)
Office of Pesticide Programs